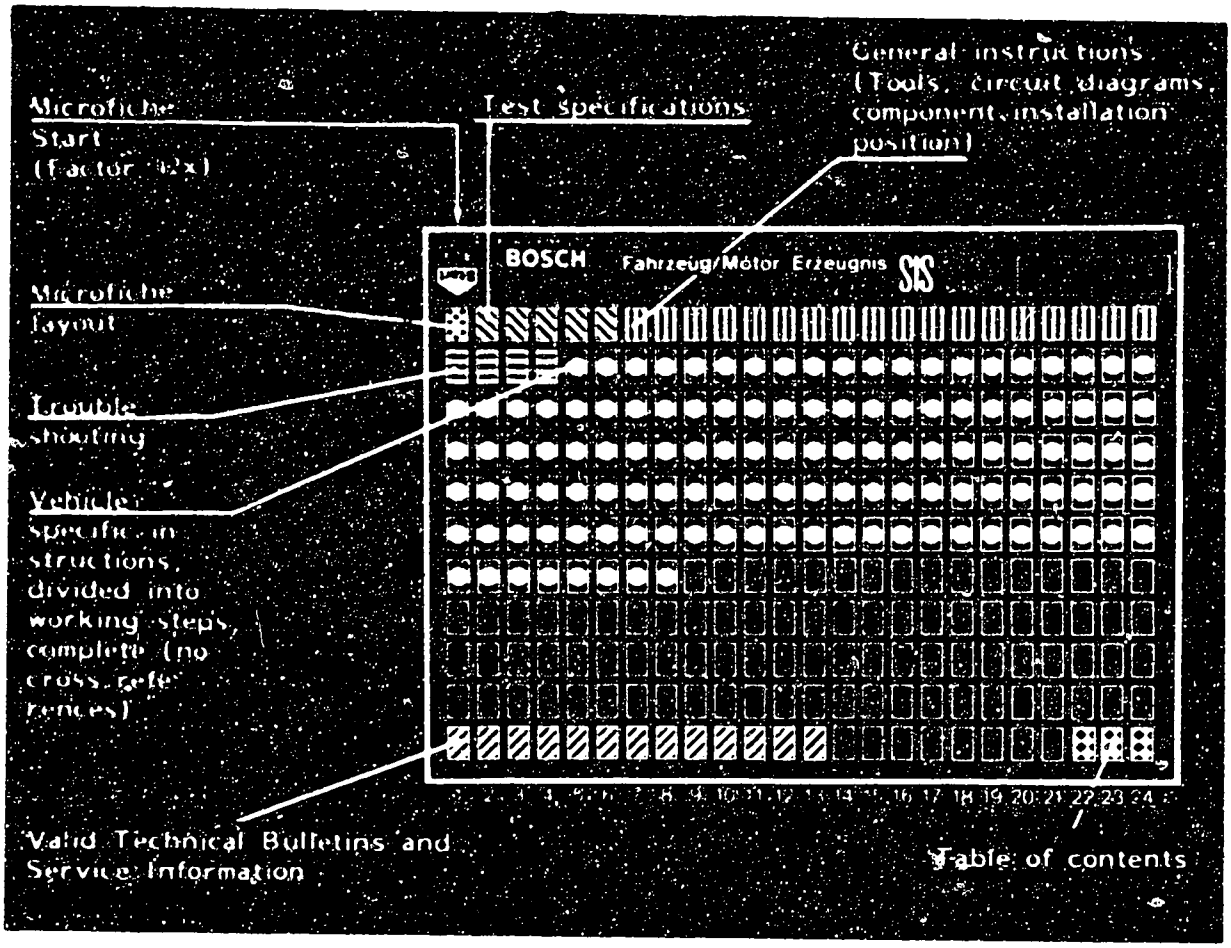
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

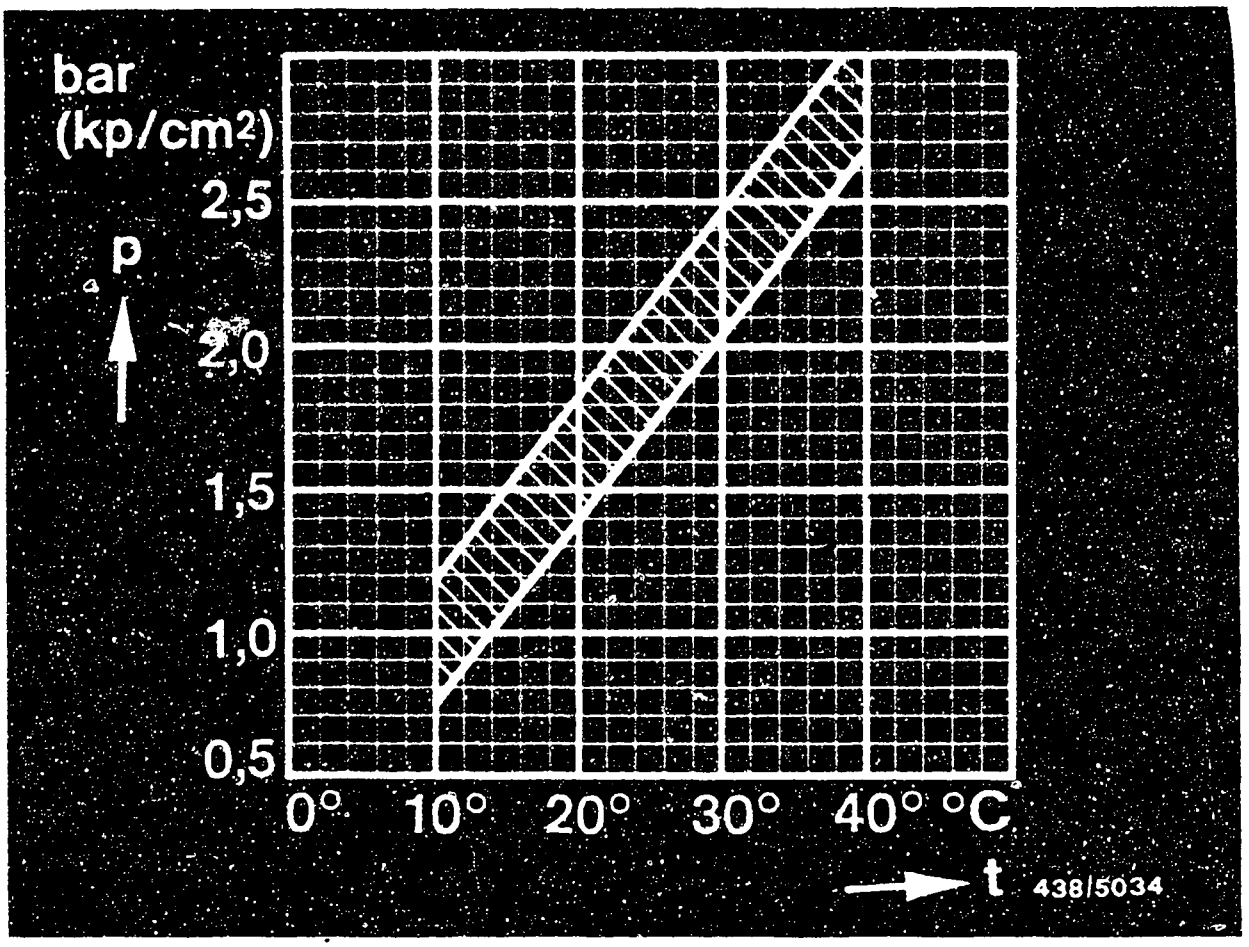
C6

1. Test specifications

1.1 Electric fuel pump

C2

Test step	Test specifications
Fuel delivery:	min. 850 cm^3/30 s



p = Control pressure (gauge pressure)
t = Ambient temperature

1.2 Control pressure "cold"

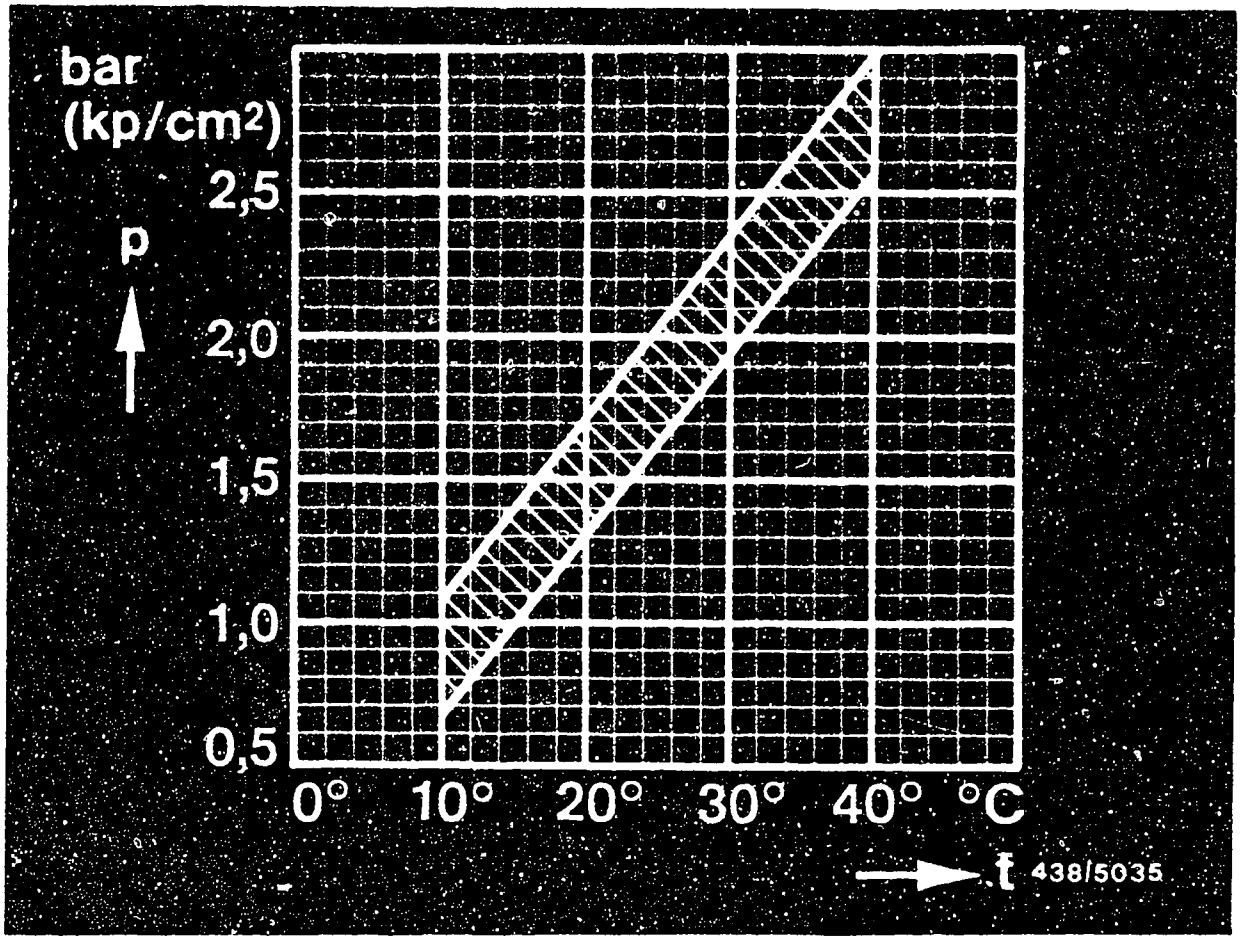
C11

Part No. of warm-up regulator: 0 438 140 113
0 438 140 114

(Version for intake-manifold-pressure-controlled full-load enrichment).

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 400...600 mbar
(300...450 mmHg)



p = control pressure (gauge pressure)
t = ambient temperature

C11

Control pressure "cold"

Warm-up regulator part no.: 0 438 140 120
0 438 140 121
(Version for intake-manifold-pressure-controlled full-load enrichment)
For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 400...600 mbar
(300...450 mmHg)

Test step	Test specifications *

D1

1.3 Control pressure "warm"

- Test at atmospheric pressure (without vacuum)

  Warm-up regulator part no.:

  0 438 140 113
  0 438 140 114
  0 438 140 120
  0 438 140 121

  → 2,7...3,1 bar (2,8...3,2 kgf/cm²)

- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator. Setting value: 400...600 mbar (300...450 mmHg)

  Warm-up regulator part no.:

  0 438 140 113
  0 438 140 114

  → 4,0...4,4 bar (4,1...5,4 kgf/cm²)

  0 438 140 120
  0 438 140 121

  → 3,4...3,8 bar (3,5...3,9 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications*

1.4 Leak test on full-load diaphragm

Setting value:
400 ... 600 mbar
(300...450 mmHg)

Warm-up regulator no.	
0 438 140 113 0 438 140 114 0 438 140 120 0 438 140 121	max. allowable pressure drop 100 mbar (75 mmHg) / 15 s

1.5 Primary pressure

Fuel distributor Part no.	Checking value:	Setting value:
0 438 100 125 0 438 100 126	4.7...5.4 bar (4.8...5.5 kgf/cm²)	4.9...5.1 bar (5.0...5.2 kgf/cm²)

1.6 Leak test

Fuel accumulator no.	Minimum pressure after 10 min.	after 20 min.
0 438 170 027 0 438 170 028	2.5 bar (2.6 kgf/cm²)	2.4 bar (2.5 kgf/cm²)

1.7 Injection valve

Injection valve no.	
0 437 502 023 0 437 502 024	Opening pressure 3.0 ... 4.1 bar (3.1...4.2 kgf/cm²)

* Pressures in the test specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

1.8 Fuel distributor

E1

Comparative measurement of deliveries.
Fuel distributor part no.: 0 438 100 125
0 438 100 126

	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	118.0 cm^3/min.	130.0 cm^3/min.

This full-load delivery must at least be reached with maximum deflection of air-flow sensor plate.

1.9 Idle adjustment *

F13

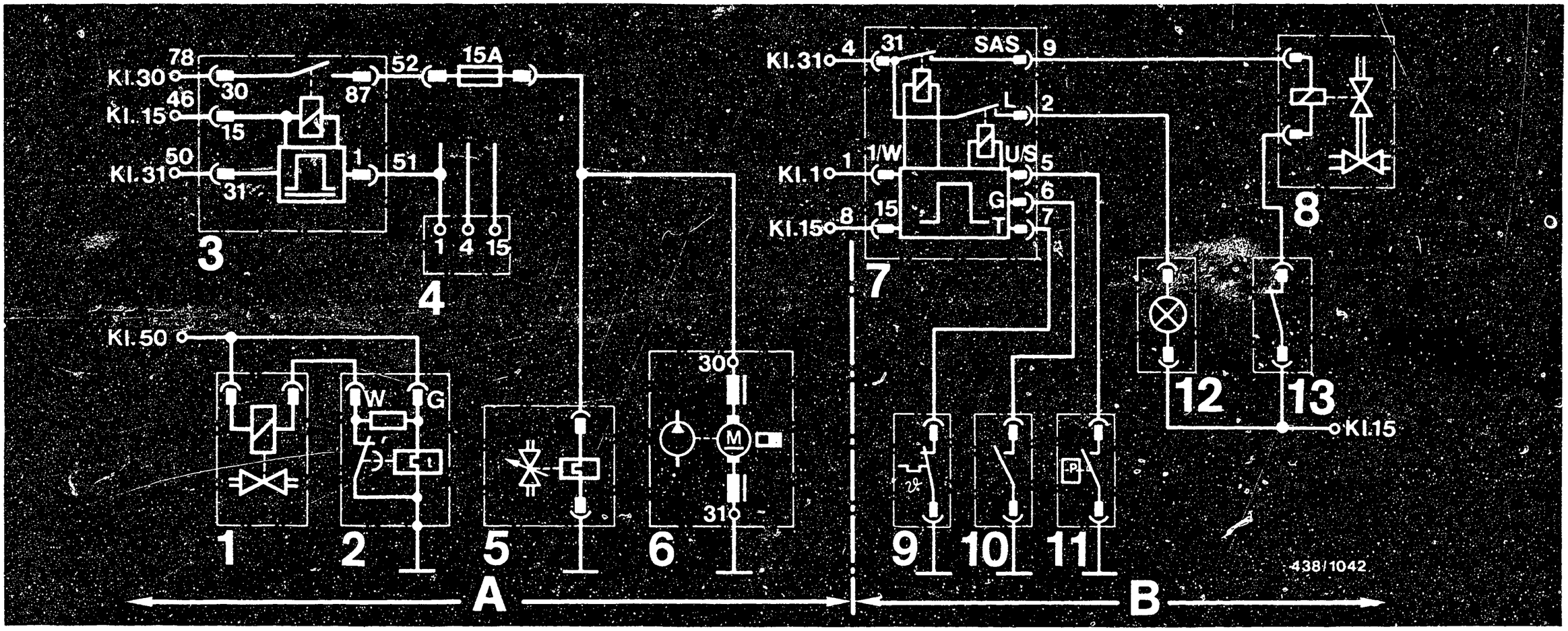
- Idle speed
  Audi 100 / 5 E and Audi Coupé GT/5E: 750...850 min^{-1}

  With idle controller current
  Vehicles without air conditioner (or air conditioner switched off). 0.4...0.5 A
  Vehicles with air conditioner 0.3...0.4 A

- CO concentration
  Audi 100 / 5 E / Audi Coupé GT/5E 0.8...1.2 % by vol. CO

  European versions: Austrialia, Canada, Sweden and Switzerland versions: 0.3...0.7 % by Vol. CO

* For checking/setting the idle adjustment: Switch on upper beam, switch off air conditioner. Engine at normal operating temperature. Radiator fan must not operate while adjusting. Overrun cutoff and exhaust-gas recirculation (if fitted) must be rendered inoperative. Remove crankcase breather hose from cylinder-head cover and seal off end of hose.



A = Components of injection system/of ignition

1 = Start valve
2 = Thermo-time switch
3 = Electronic relay
4 = Ignition coil
5 = Warm-up regulator
6 = Intank electric fuel pump

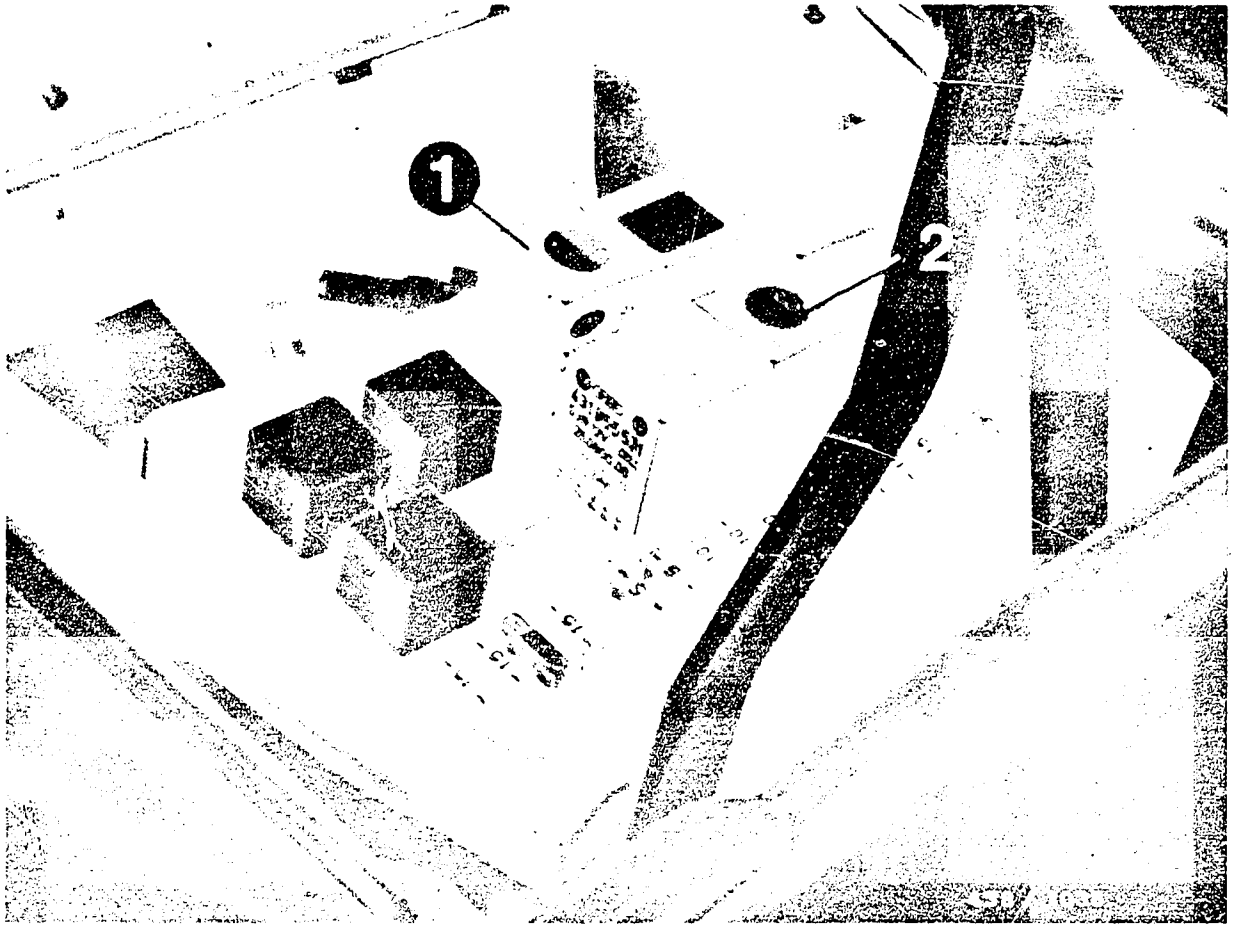
B = Components of overrun cutoff and gear-shift indicator

7 = Control unit for gear-shift indicator
8 = Overrun cutoff valve
9 = Thermo-switch
10 = Gear switch
11 = Vacuum switch
12 = Bulb for gear-shift indicator
13 = Throttle-valve switch

2. Electrical safety circuit with overrun cutoff and gear-shift indicator

2.1 Circuit diagram

The safety circuit with electronic relay is energized from terminal 1 of the ignition coil.
Overrun cutoff valve and gear-shift indicator bulb are energized from the gear-shift indicator control unit.

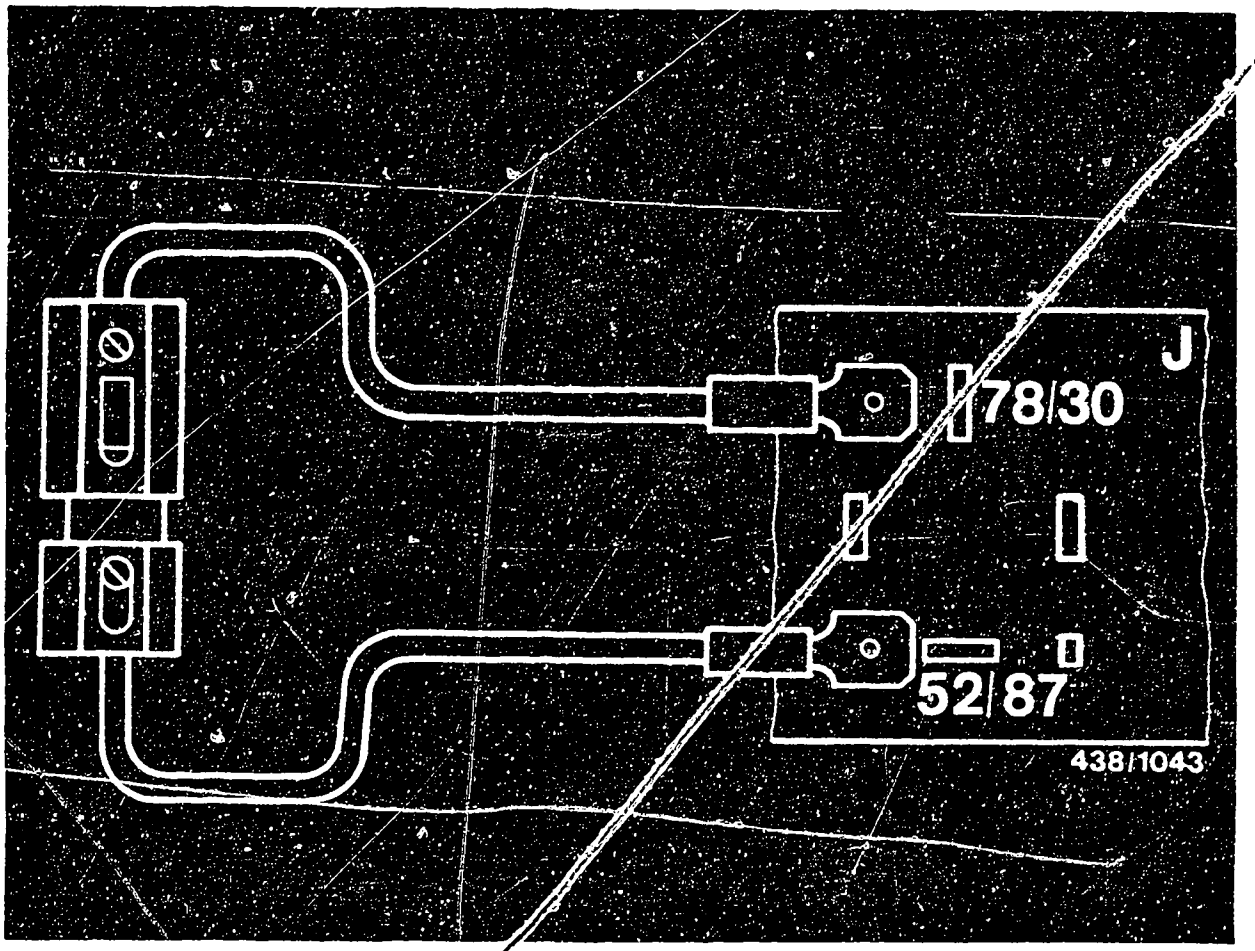


1 = Control unit for gear-shift indicator and overrun cutoff
2 = Electronic relay

2.2 Bridging the safety circuit

In order to carry out testing operations with the engine stopped, it is necessary to bridge the safety circuit.

To do this, remove the electronic relay (arrow) from the relay board. Electronic relay is located in the central -electrics console in the engine compartment on the left-hand side in front of the windshield.



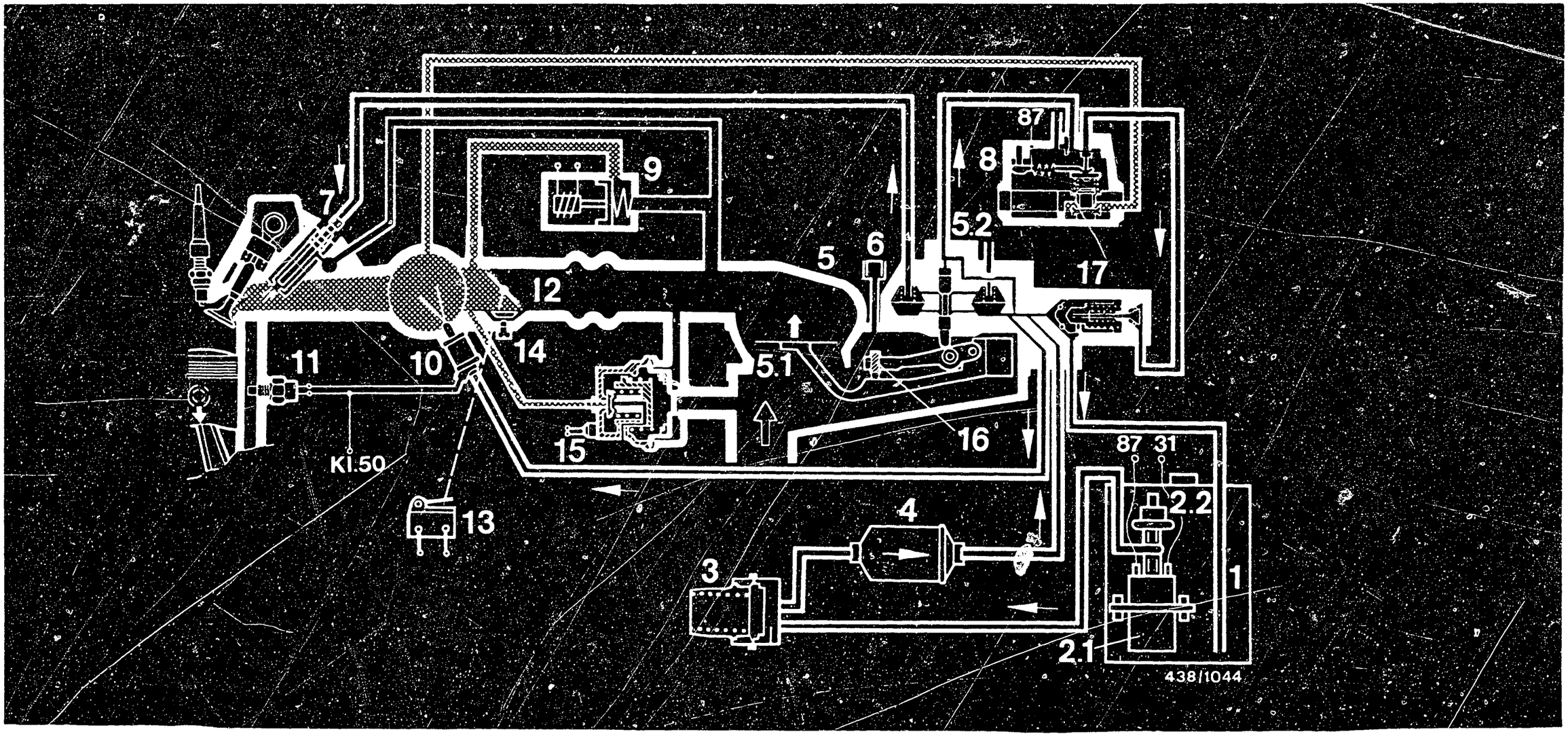
Connect contacts J 39 and J 40 in the base with a bridge.

Use connecting cable 1.5 mm^2 with fuse holder and 16 A fuse (to be user-fabricated according to sketch),

Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.

CAUTION!

Never deflect (raise) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



1 = Fuel tank
2.1 = Intank electric fuel pump
2.2 = Pressure damper
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Anti-tamper cap
7 = Injection valve
8 = Warm-up regulator
9 = Idle controller
10 = Start valve
11 = Thermo-time switch
12 = Throttle valve
13 = Microswitch
14 = Bypass screw
15 = Overrun cutoff valve
16 = Idle-mixture-adjusting screw
17 = Primary-pressure regulator, with push valve

3. Diagram of fuel lines

4. General information

4.1 Introduction

The following Audi vehicles are delivered with 2.2 l/5-cylinder engine with K-Jetronic:

Audi 200 / 5E	(as of 5.1983)	Europe version
Audi 100 / 5E	(as of 8.1982)	Europe version Australia, Canada, Sweden and Switzerland versions
Audi Coupé GT/5E	(as of 8.1982)	

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.
All the system components are dealt with in separate working steps with the corresponding test specifications.
In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.
The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation.
In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

4.2 Design

The entire system of the K-Jetronic in these vehicle models corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

4.3 The following components are different or extra:

- Intank electric fuel pump with replaceable non-return valve and screwed-on pressure damper for noise reduction.
  The completely assembled unit is latched inside into the base of the fuel tank.
  The electric fuel pump is accessible through a closure ring on the top side of the fuel tank.

- 5-cylinder mixture-control unit with updraft air-flow sensor.
  In some cases, with angle sensor (potentiometer) for fuel consumption indicator.

- Warm-up regulator for manifold-pressure-controlled full-load enrichment.
  Control-pressure reduction at full load.
  Manifold-pressure connection on intermediate plate.

- Air-shrouded injection valve for improved mixture formation particularly at idle.
  Air distribution takes place in cylinder head.

- No auxiliary-air device, instead idle controller with control unit (relay) for idle speed stabilization (not made by Bosch). Operation similar to Bosch idle-speed control.

- Temperature- and engine-speed-dependent overrun cutoff as standard.
  Energized by throttle-valve microswitch and gear-shift indicator control unit (relay).

- Electrical safety circuit for electric fuel pump and warm-up regulator through electronic relay.
  This ensures that, with the engine stationary and the ignition on, the electric fuel pump cannot start and the warm-up regulator cannot shut off prematurely.

4.4 Other equipment

Vehicles of the Australia, Canada, Sweden and Switzerland version are equipped with exhaust-gas recirculation (EGR).

- With exhaust-gas recirculation, some of the exhaust gases are returned from the exhaust system to the intake system to take part once again in combustion. This reduces the concentration of nitrogen oxides (NOx) in the exhaust gas. Exhaust-gas recirculation is not operational with the engine cold or at idle speed.

When performing trouble-shooting and adjustments in the vehicle, particularly when adjusting the idle speed, the influence of this additional (possibly defective) equipment should be borne in mind.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P 100/12 (previously KDEP 1034/12).
  For connecting pressure tester to the control-pressure port of the fuel distributor.

- Adjusting wrench KDEP 1035.
  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)
  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Graduate (commercially available, capacity approx. 1.5 l)
  For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Tool set for fitting and removing the idle CO anti-tamper device of air-flow sensor.
  (e.g. No. 4521/7 from Hazet, 5630 Remscheid).

- Multimeter, Ri ≧ 20 kΩ/V, commercially available

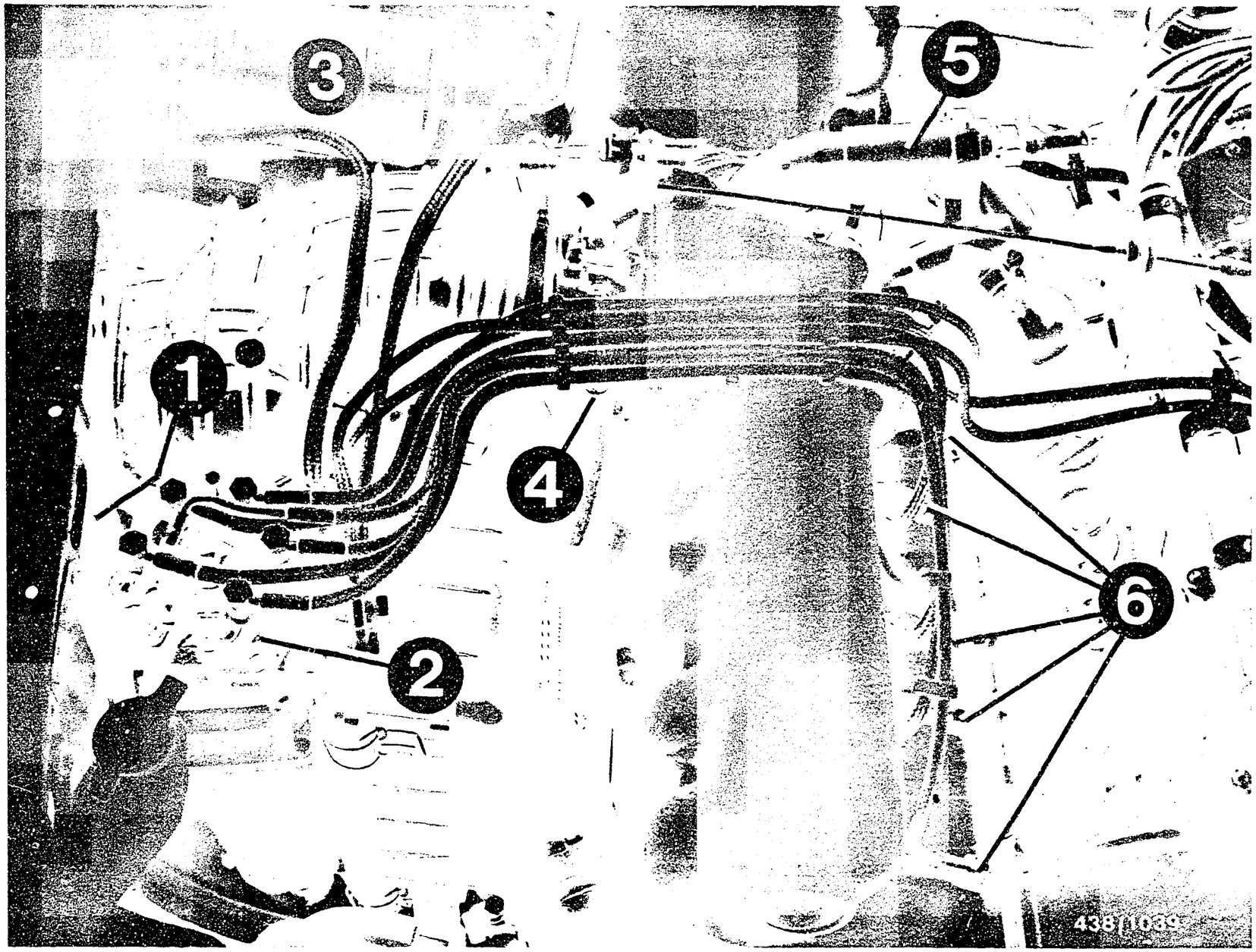
- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

  Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
  Bosch, Part Designation VS 14942-CH
  Previously Part No. 5 973 340 650
  The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
  Firma
  Oskar Gnamm GmbH & Co
  D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)
  For idle-speed adjustment.
- CO meter (commercially available)
  For idle-speed CO adjustment.
- Vacuum pump (commercially available)
  For testing the warm-up regulators with full-load enrichment dependent on intake-manifold pressure, e.g. the vacuum hand-operated pump from

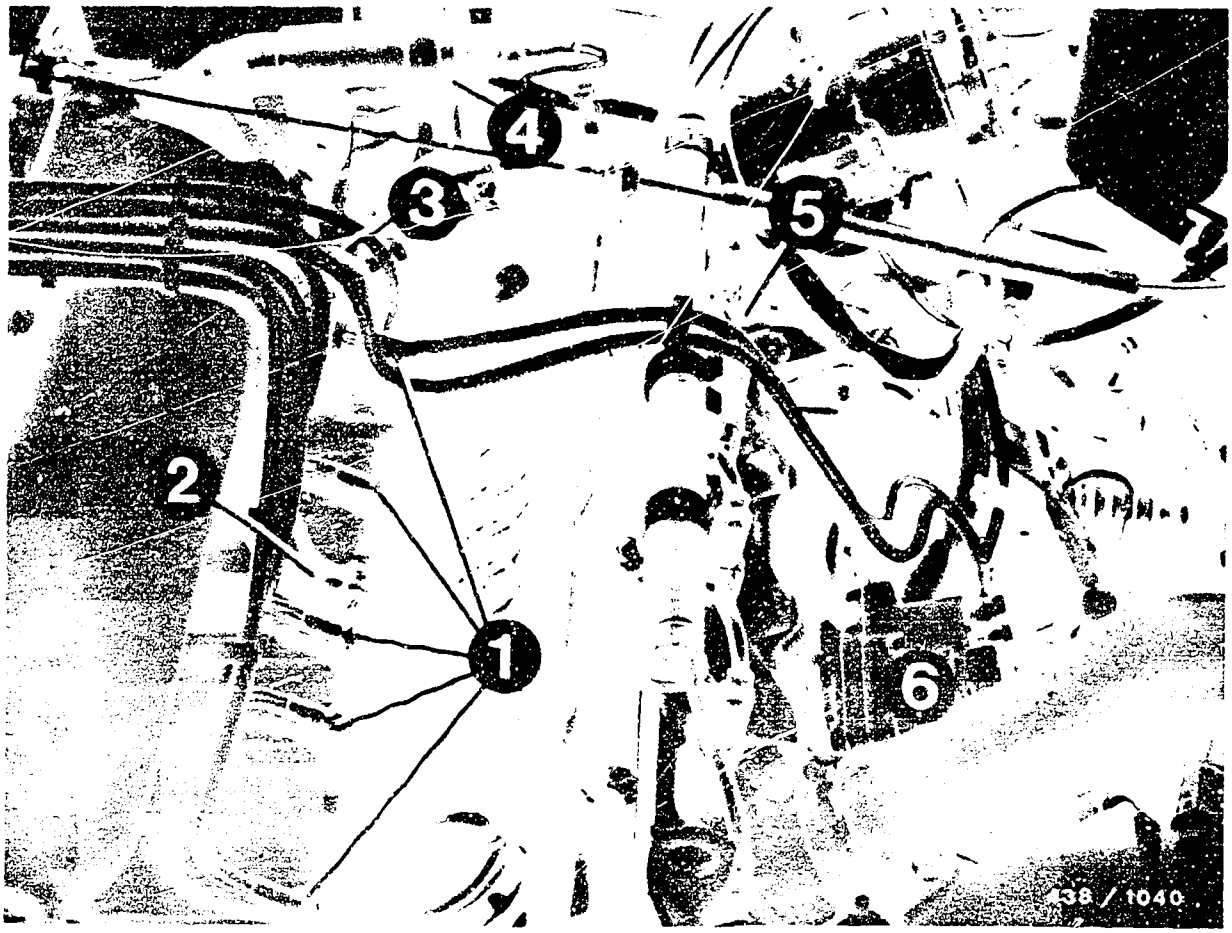
  Firma Korinth
  Ludwig-Kloos-Strasse 21
  6450 Hanau 7 (Steinheim)



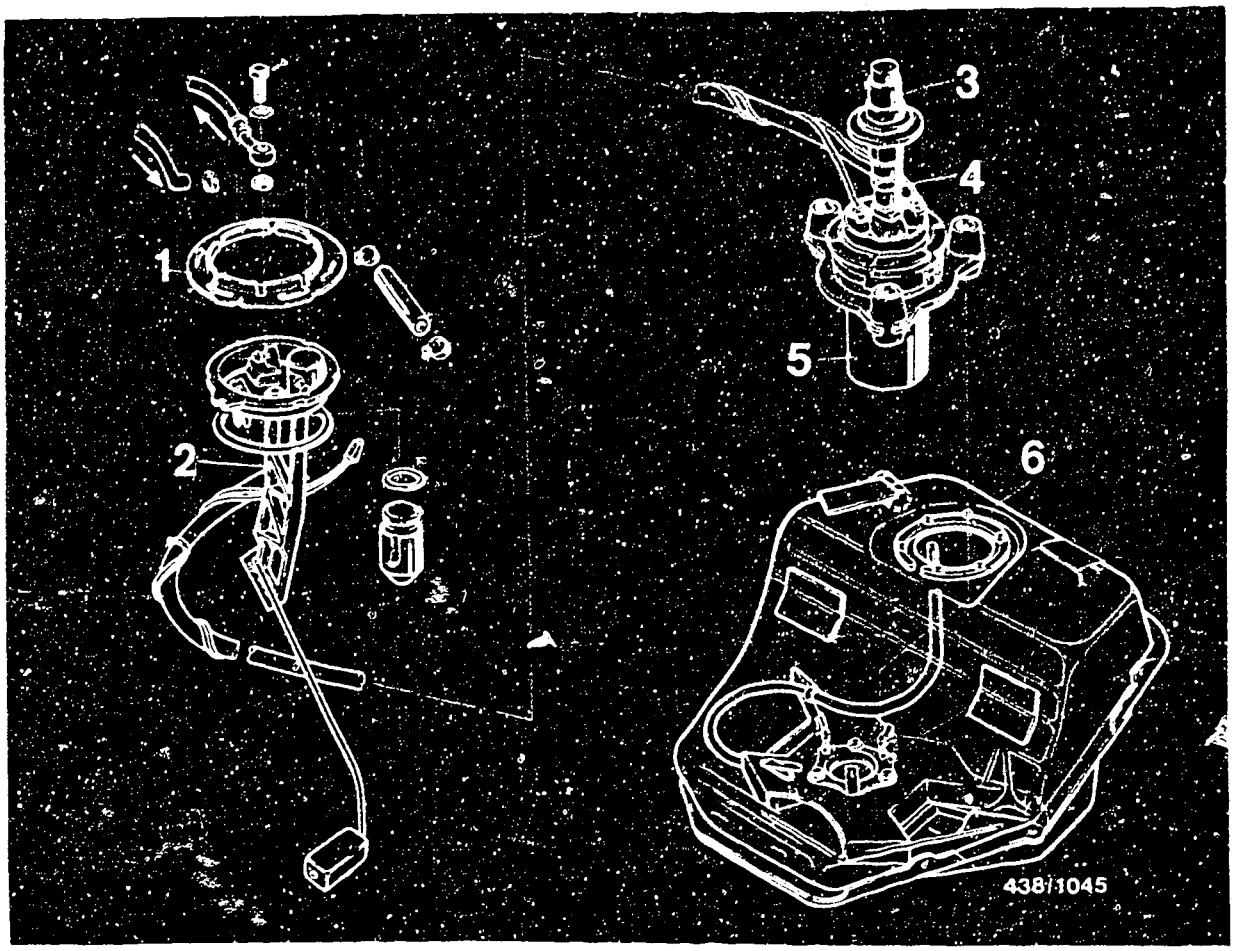
1 = Overrun cutoff valve (concealed behind the right-hand side wall)
2 = Mixture-control unit
3 = Fuel filter
4 = Microswitch (concealed under throttle-valve assembly)
5 = Idle controller
6 = Injection valves

6. Installation position of individual components

6.1 Arrangement of components on engine



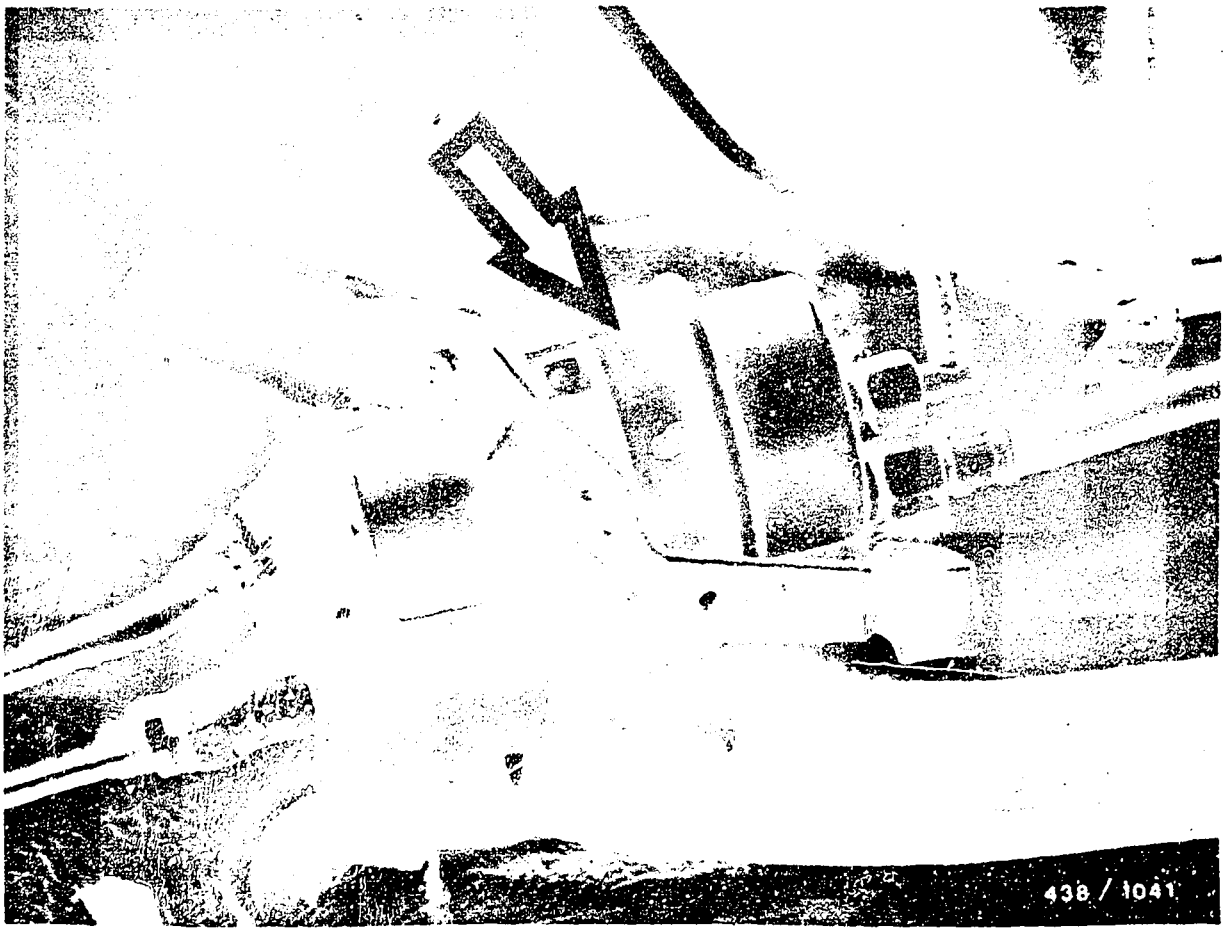
1 = Injection valves
2 = Air supply for air-shrouded injection valves
3 = Start valve
4 = Idle controller
5 = Thermo-time switch
(concealed on rear end face of cylinder head)
6 = Warm-up regulator



1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

6.2 Fuel-supply components

The intank electric fuel pump with replaceable non-return valve and screwed-on pressure damper is accessible through the closure ring on the top side of the fuel tank.



The fuel accumulator (arrow) is mounted by means of a bracket on the vehicle underside, to the right in front of the fuel tank.

The connections must be cleaned thoroughly before replacing the fuel accumulator.

7. Trouble-shooting

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be performed for certain faults.

According to the symptom stated by the customer or which you have determined yourself, select the possible cause in the trouble-shooting chart. The Coordinates at the end of the cause column refer to the appropriate test step with the associated test specification.

Important note:
If any fuel connections are loosened, parts removed (also on the vacuum system), always use new seals when reconnecting or when re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

7. Trouble-shooting chart

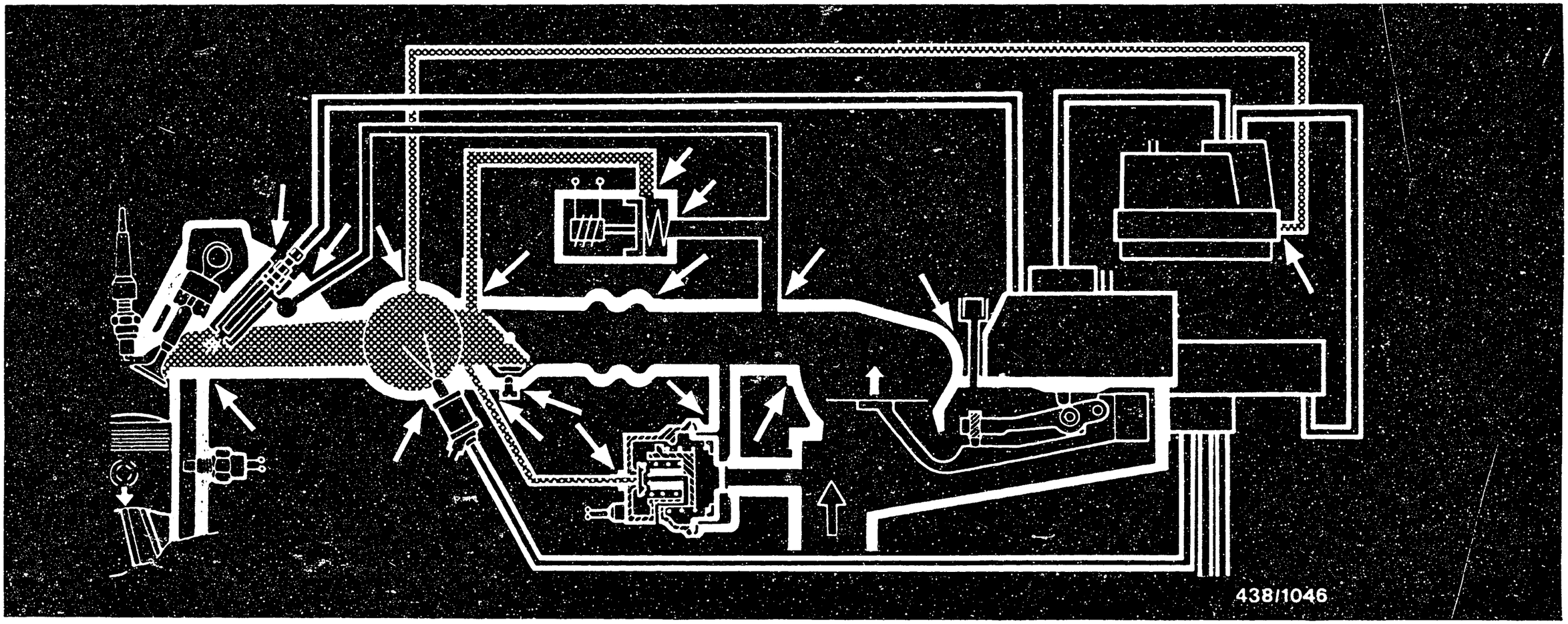
Customer complaint (fault system)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition*	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinate
	•	•	•	•		•	Vacuum system leaking	B 6
•	•		•	•	•	•	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	•						Position of the air-flow sensor plate incorrect	B 18
•		•					Idle speed stabilization defective	H 1
	•	•	•	•		•	Overrun cutoff defective	C 1
•	•				•		Electric fuel pump not operating	C 2
•							Cold-start valve leaking	C 7
		•	•				Excessive fuel quantity for control-pressure circuit	C 9
				•			"Cold" control pressure outside tolerance	C 14
•		•					"Warm" control pressure too high (after warm-up)	C 11
	•		•	•	•	•	"Warm" control pressure too low (after warm-up)	C 11
			•	•		•	Primary (system) pressure outside tolerance	C 11
					•	•	Overall fuel system leaking	D 8
	•						Injection valves leaking, opening pressure too low	D 16
•	•	•	•		•		Unequal fuel delivery (imbalance of fuel delivery)	E 13
•	•	•	•			•	Basic idle adjustment incorrect	F 1
•	•	•	•	•			Basic CO setting incorrect	F 13
						•	Throttle plate does not open completely	---

*Note
If, in the case of Sympton 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinate L 5.

8. Engine "diesels" (runs on)
9. Fuel consumption too high
10. Flat spot during acceleration
11. CO concentration at idle too high
12. CO concentration at idle too low
13. Idle speed not adjustable (too high)
14. Engine starts but then dies

8	9	10	11	12	13	14	Cause	Coordinates
		•		•			Vacuum system leaking	B 6
•		•	•	•			Air-flow sensor lever/control plunger not moving freely	B 8
•							Position of air-flow sensor plate incorrect	B 18
					•		Idle speed stabilization defective	H 1
	•	•		•		•	Overrun cutoff defective	G 1
						•	Electric fuel pump not operating	C 2
•	•		•				Start valve leaking	C 9
		•				•	Fuel delivery for control-pressure circuit excessive	C 14
		•				•	"Warm" control pressure (after shutoff) too high	C 11
	•	•	•			•	"Warm" control pressure (after shutoff) too low	C 11
		•				•	Primary pressure outside tolerance	D 8
•							Injection valves leaking, opening pressure too low	E 13
		•					Fuel delivery imbalance (dispersion of deliveries)	F 1
•	•	•	•	•			Basic CO setting incorrect	F 13



Test steps

8. Testing the air-intake system of the engine for leaks

The arrows in the picture show the typical points at which leaks can occur. Perform visual examination, or, if unsure, proceed as follows: Remove hose from outlet of idle controller and blow air through this hose into the intake system with a compressed-air gun. Open throttle valve fully while doing this. Brush joints with soapy water or spray with leak detector (e.g. Güpoflex).

Under no circumstances may combustible liquids be used for the leak test.
Bubbling or foaming indicates a leak.
When performing the leak test, pay particular attention to the insulating sleeves of the injection valves. If necessary, tighten using hexagon-socket-screw key (AF 12 mm).
When a leak has been remedied, carry out the idle adjustment with the engine at normal operating temperature:
Idle adjustment is described on Coordinates F13.

9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

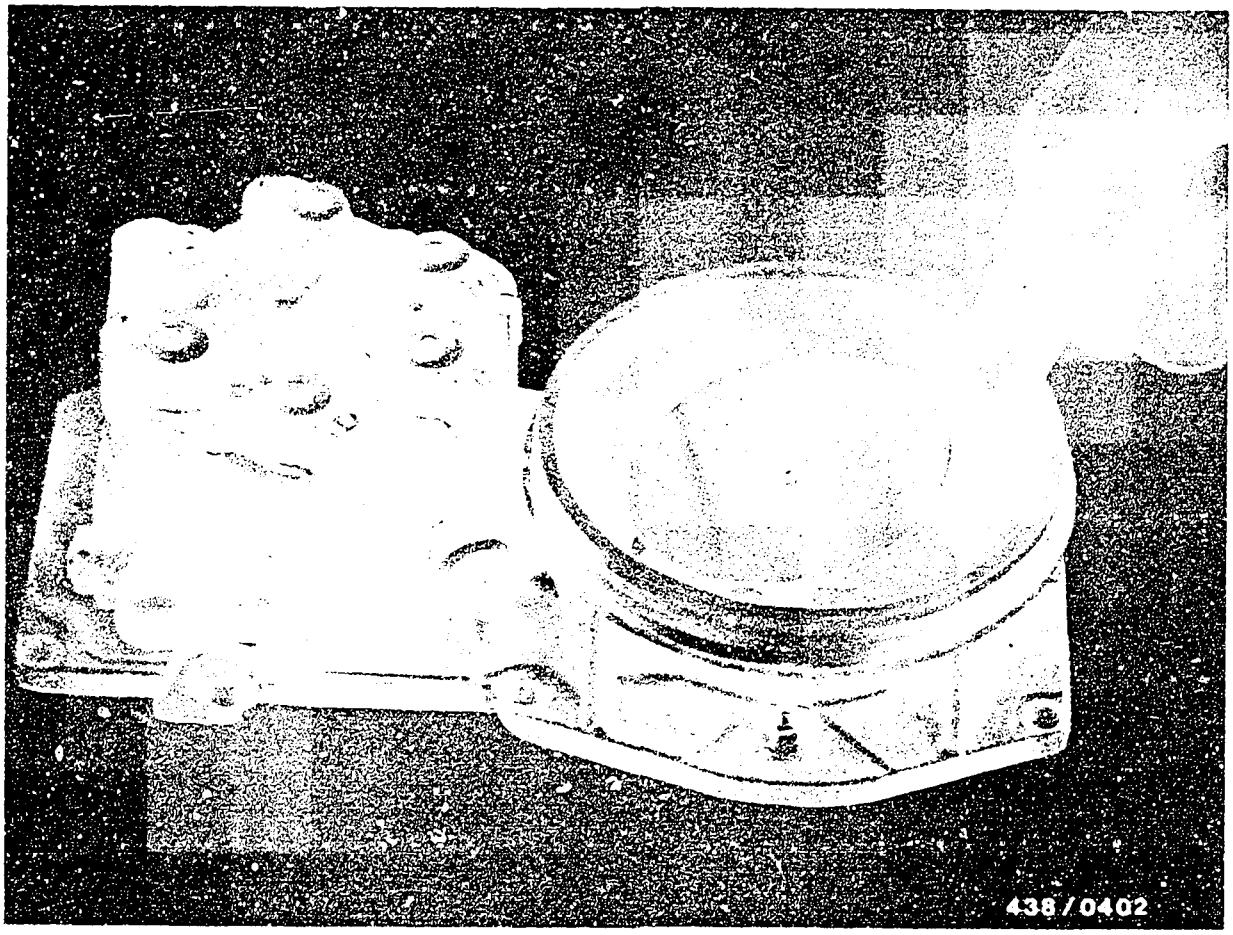
- Engine temperature not below +20 °C.

- Remove the rubber hood (release 2 clamping brackets) so that the air-flow sensor plate becomes accessible.

- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

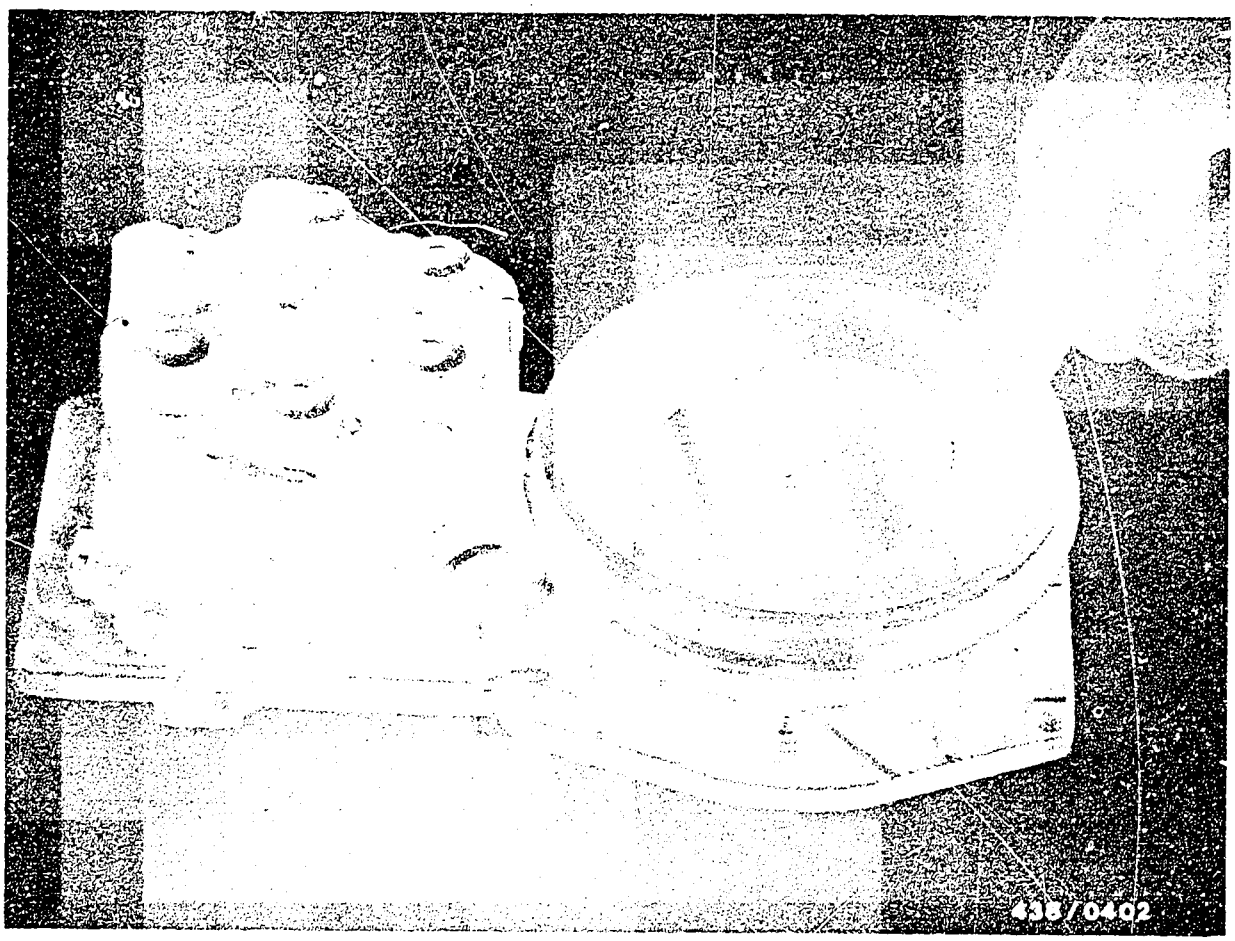
Caution!

Never deflect (raise) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



9.2 Check that the control lever moves freely

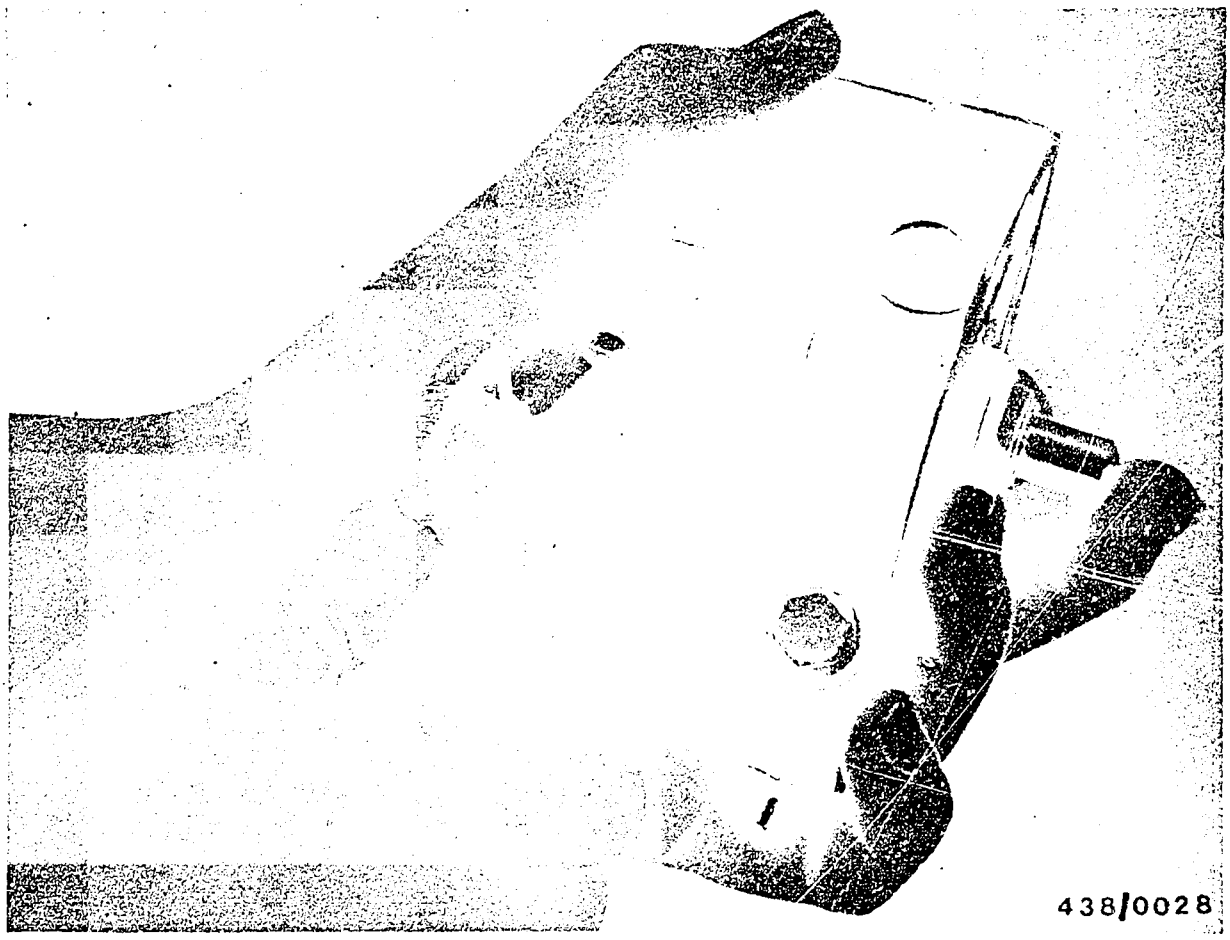
Raise the air-flow sensor plate by hand (updraft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Peugeot parts).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely.

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement. Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely. If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!
Note the following when installing fuel components and fuel lines:
Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

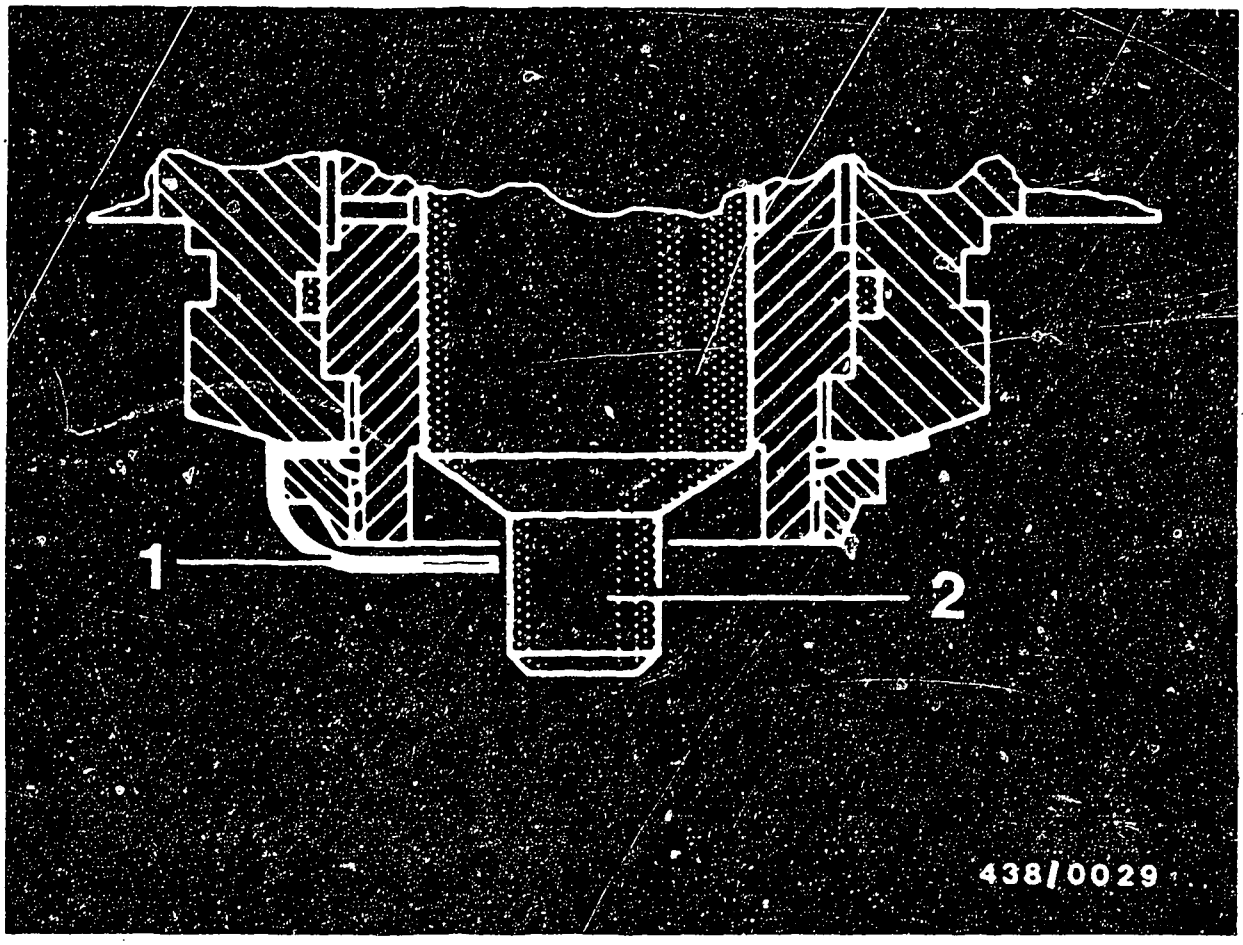


Unscrew three fastening screws and remove fuel distributor from air-flow sensor.

Remove control plunger. It may be necessary to blow compressed air very briefly through the control pressure connection port in order to remove the control plunger Hold control plunger with your hand while doing this. Thoroughly wash control plunger with benzine. If this does not result in the required freedom of movement, replace fuel distributor.

Caution!

The fuel distributors are additionally equipped with a compression spring above the control plunger and a drop-out safeguard.
When removing the control plunger, first of all bend up the drop-out safeguard, paying attention to the compression spring, and re-insert the compression spring when assembling.

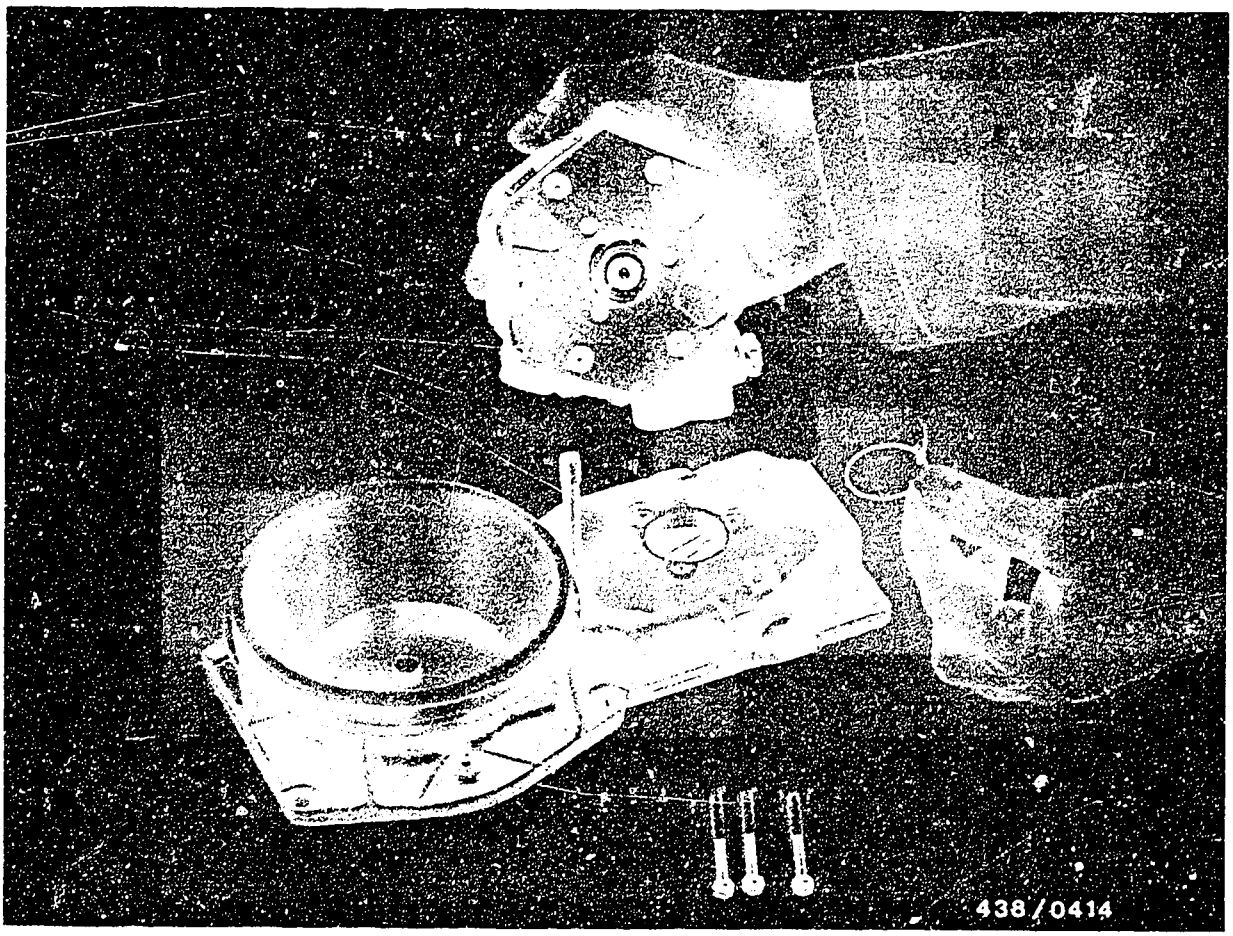


1 = Anti-drop-out device
2 = Control plunger

9.4 Fuel distributor with anti-drop-out device for the control plunger

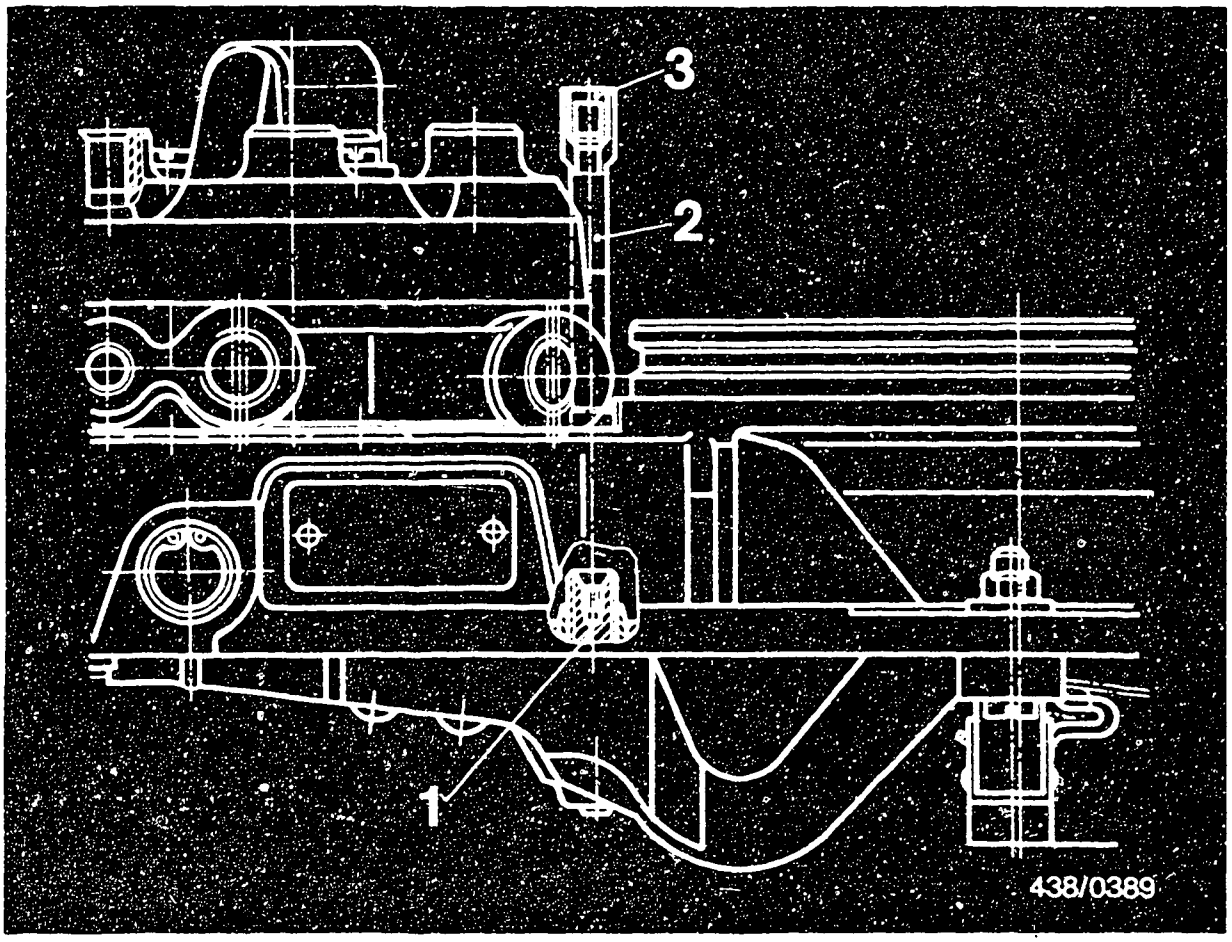
Caution!
The fuel distributors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.

The anti-drop-out device must not be removed!



9.5 Fitting the fuel distributor

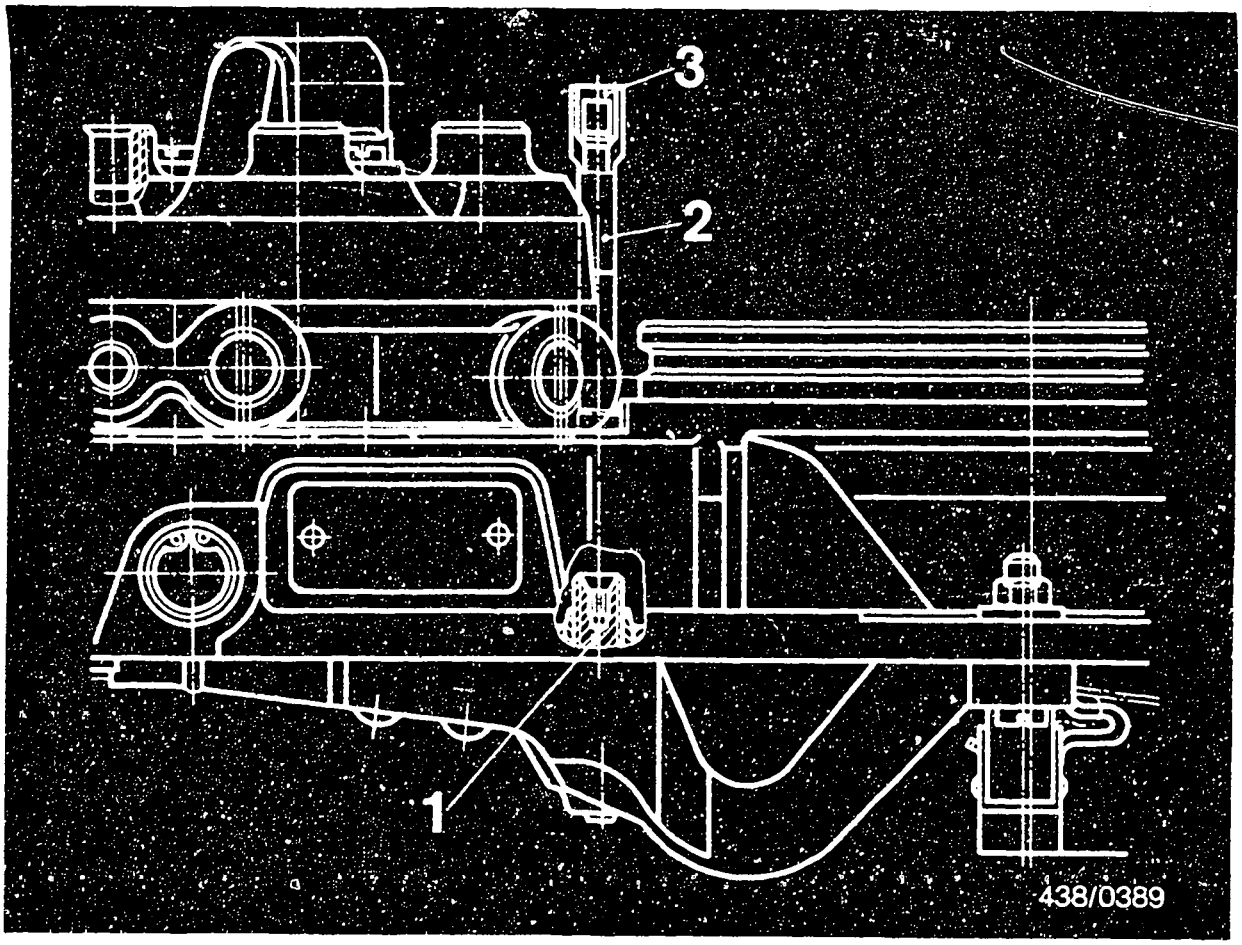
When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.



1 = Idle-mixture-adjusting screw
2 = Adjusting device
3 = Anti-tamper device (lead seal)

9.6 Matching the fuel distributor to the air-flow sensor for initial starting:

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.

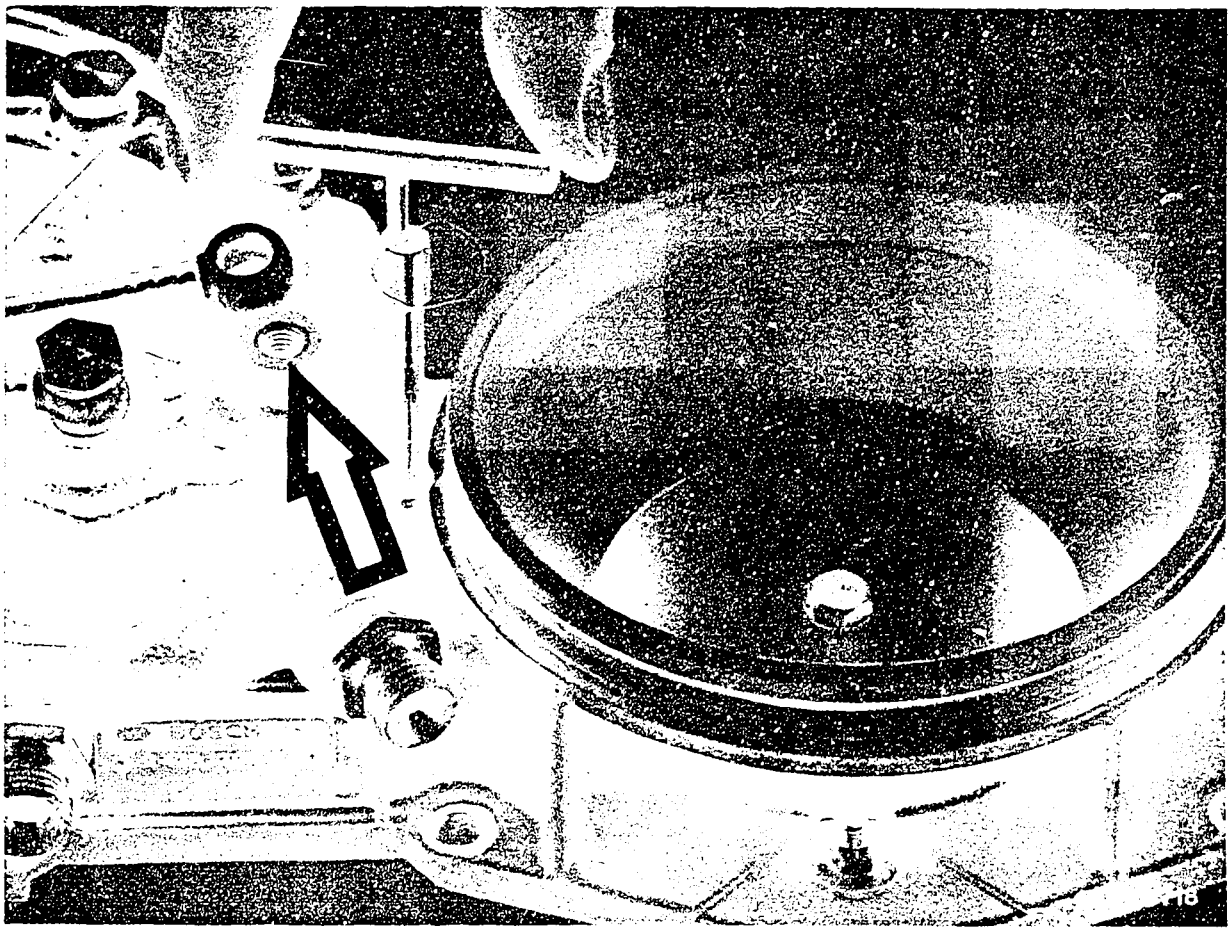


1 = Idle-mixture-adjusting screw
2 = Lead seal
3 = Screw plug

Remove the anti-tamper device and unscrew the screw plug. Insert the adjusting wrench KDEP 1035 through the bore into the idle-mixture-adjusting screw.

C A U T I O N !

Never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operating of the starting motor may lead to serious damage.



Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate F 6.

10. Checking and adjusting the position of the air-flow sensor plate

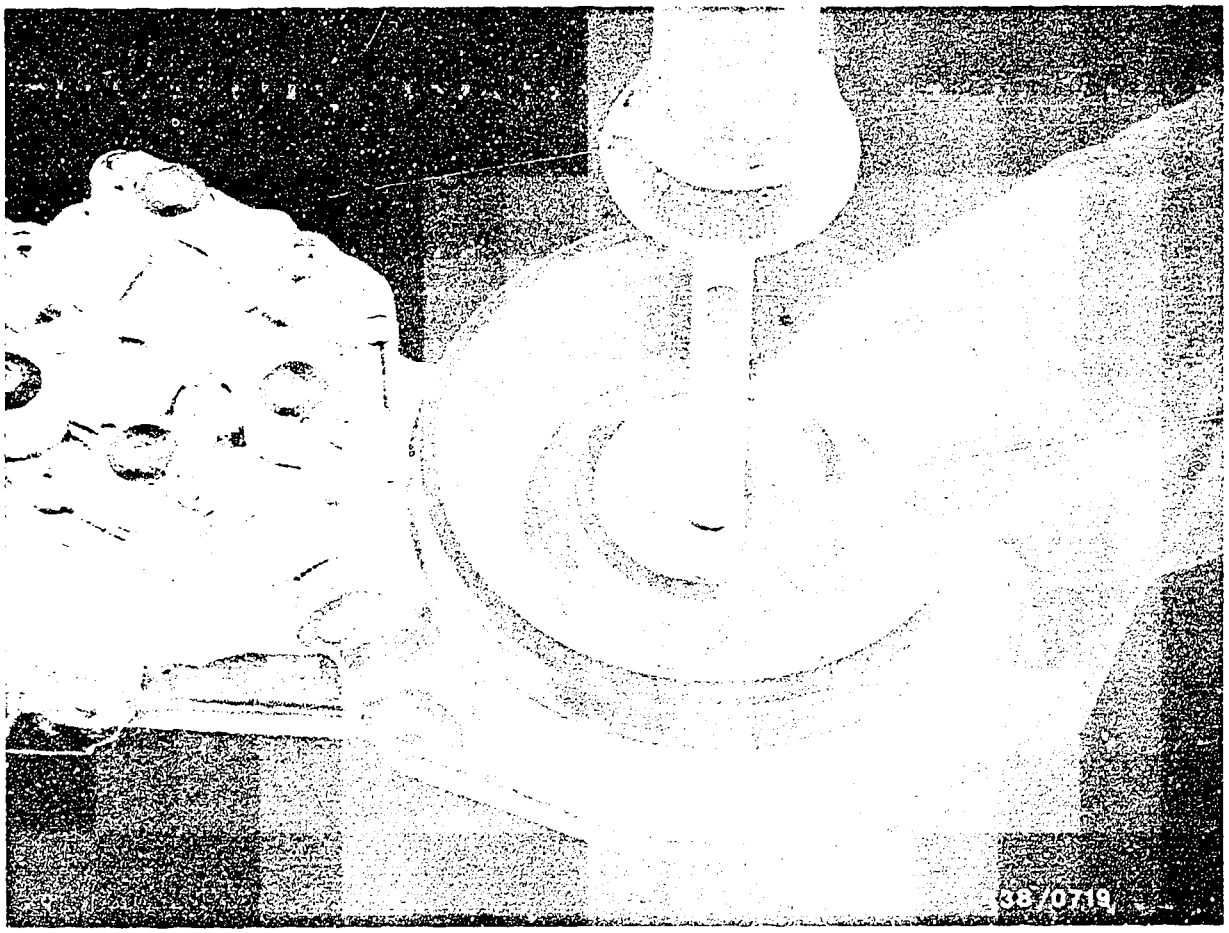
10.1 Preparations

- Engine temperature is not important.
- Remove the rubber hood fitted between the air-flow sensor and the throttle-valve assembly (release 2 clamping bands), so that the air-flow sensor plate becomes accessible.

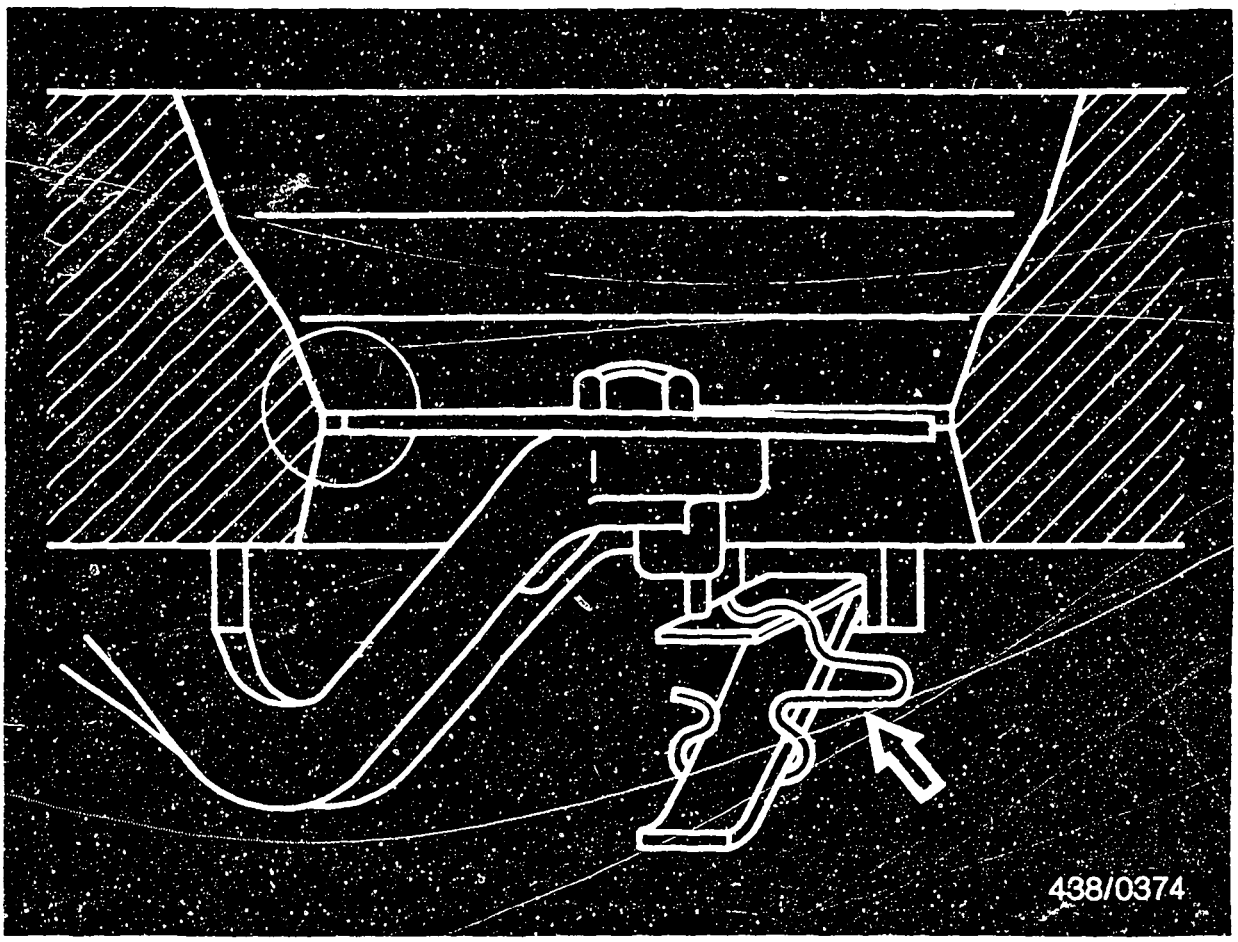
10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).
It must no longer be possible to turn the air-flow sensor plate by hand.

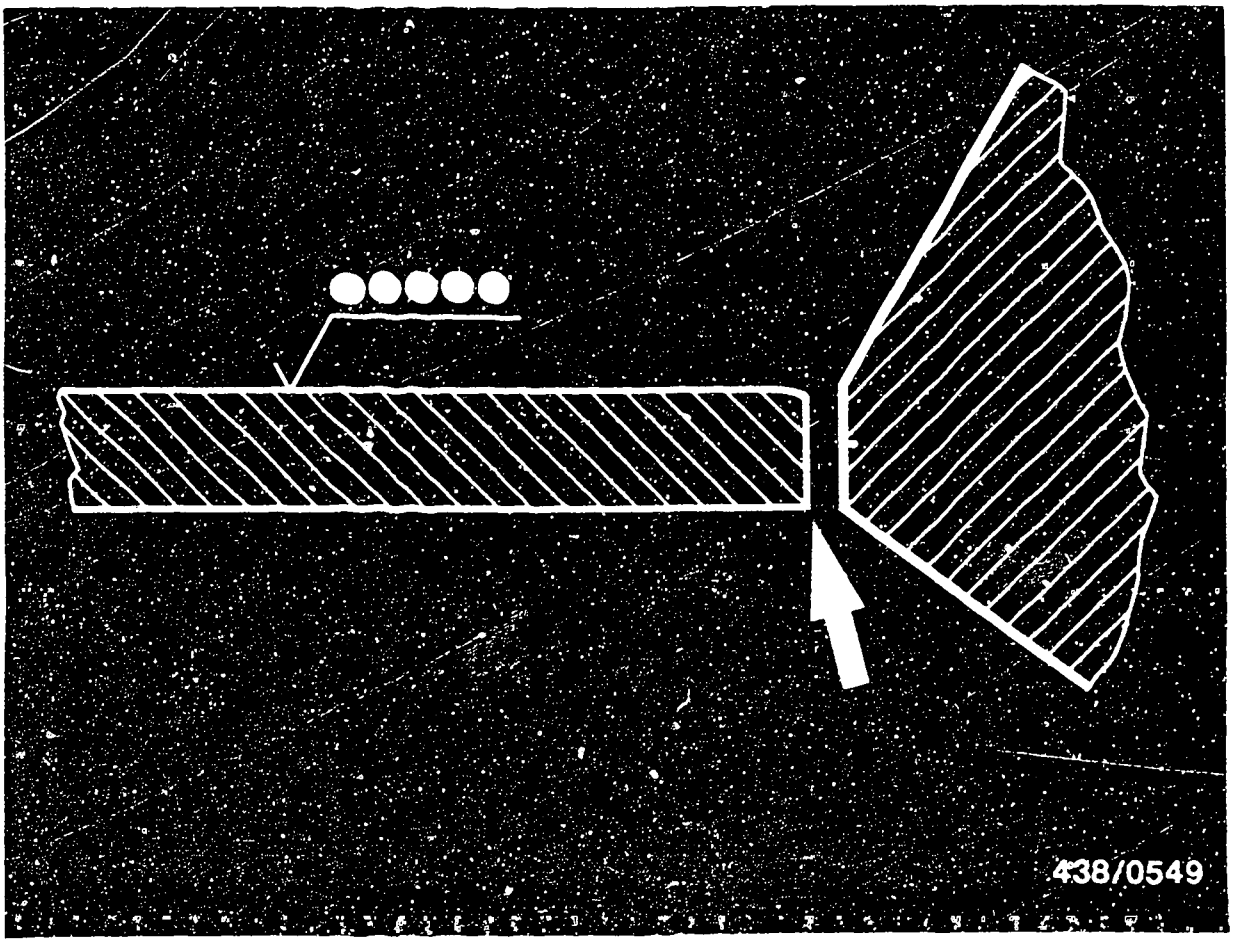


10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the cone in the position marked with a circle in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

If necessary, the position of the leaf-spring limit-stop can be corrected by adjusting the shaped spring (arrow).



1 = 5 punch marks

Caution:

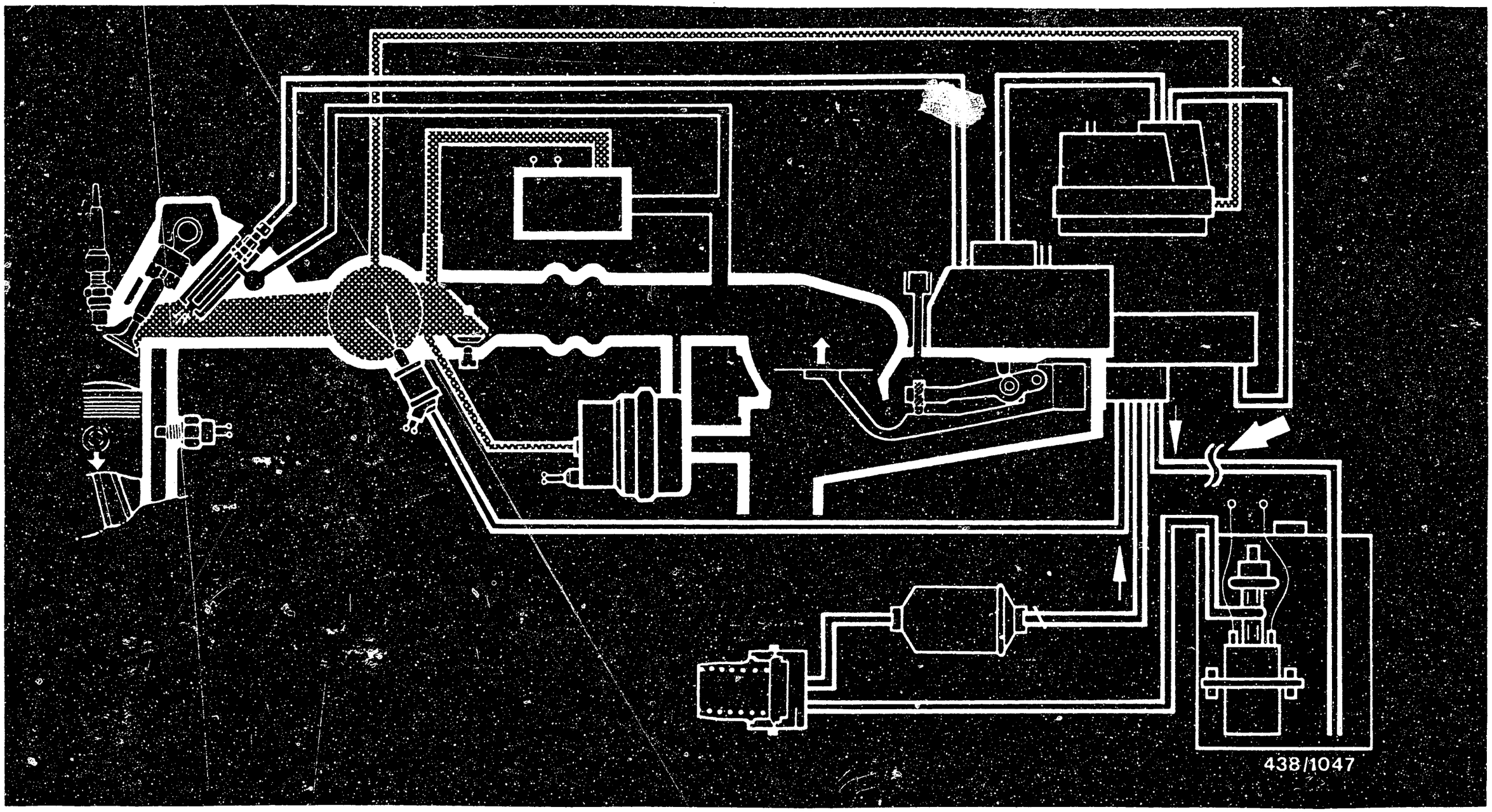
Be sure that sensor plate is mounted in correct position! Its upper side is identified by five punch marks (in a row). The sharp edge (arrow) is at the bottom.

11. Checking the operation of the auxiliary-air device (Deleted)

The otherwise usual testing of the auxiliary-air device is not applicable to these Audi 5-cylinder vehicles.

As of 8.1982 the vehicles are equipped with an electronic idle speed stabilization system (not made by Bosch) instead of the auxiliary-air device.

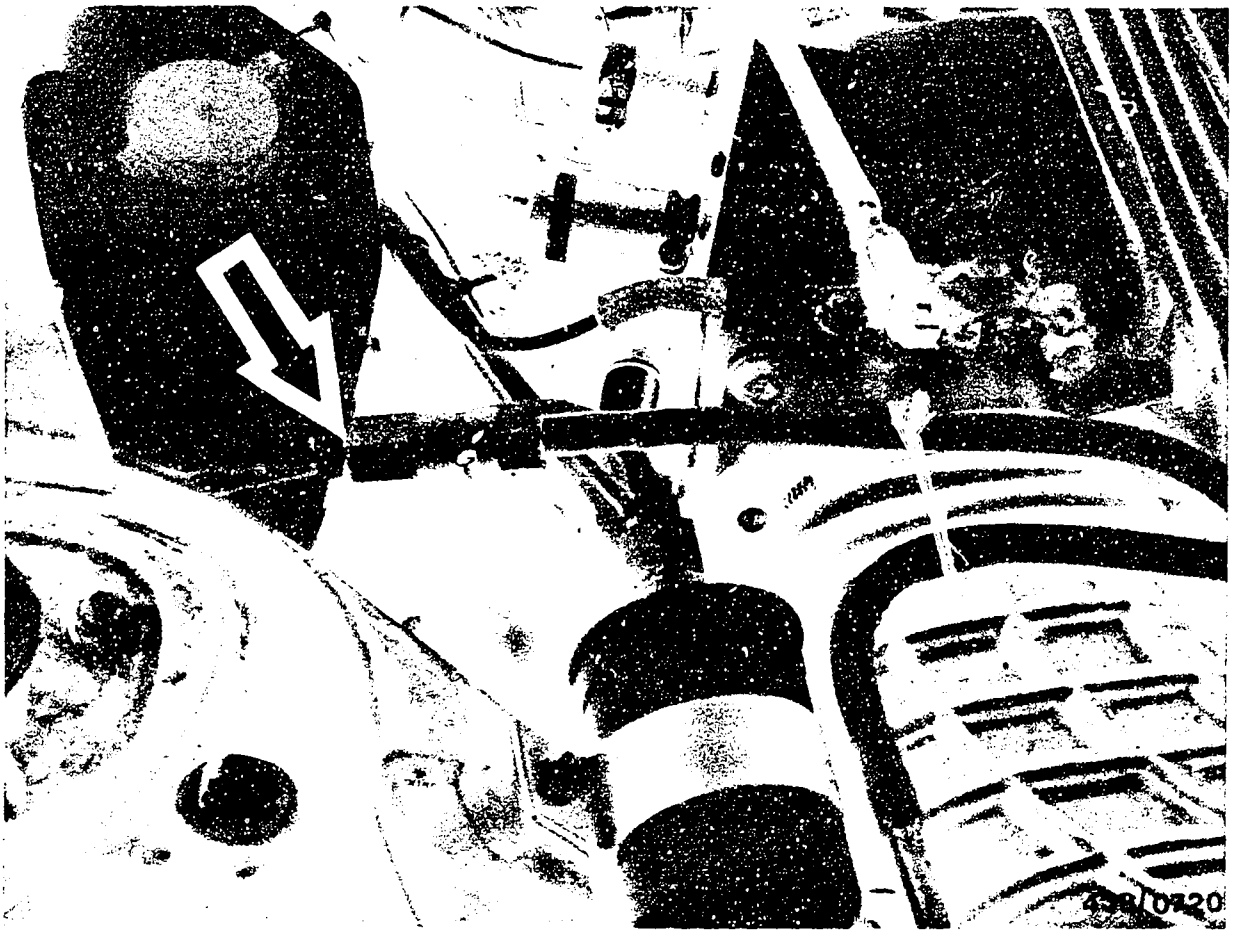
The testing of this idle speed stabilization system is described in Section 21 (Coordinate H1).



12. Checking the operation of the electric fuel pump

12.1 Requirements

Conclusive information on the operation of the electric fuel pump can be provided only by measuring the fuel delivery under pressure, i.e. under primary pressure. Therefore, this test must be performed at the return line to the fuel tank (arrow).



12.2 Measuring point

A suitable measuring point for testing the fuel delivery is the screw connector (arrow) in the fuel return line to the fuel tank.

Before undoing this connector, open the tank filler cap in order to vent the fuel tank.

Hold the end of the hose in a graduate, approx. 1.5 litres capacity, to make the measurement.

12.3 Testing

Remove plug from warm-up regulator.
Switch on electric fuel pump for precisely 30 seconds by bridging the electrical safety circuit and measure the fuel delivery in a graduate.

Caution!

Never deflect (raise) the air-flow sensor plate with the fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

12.4 Test specification

Fuel delivery: min. 850 cm^3/30 seconds

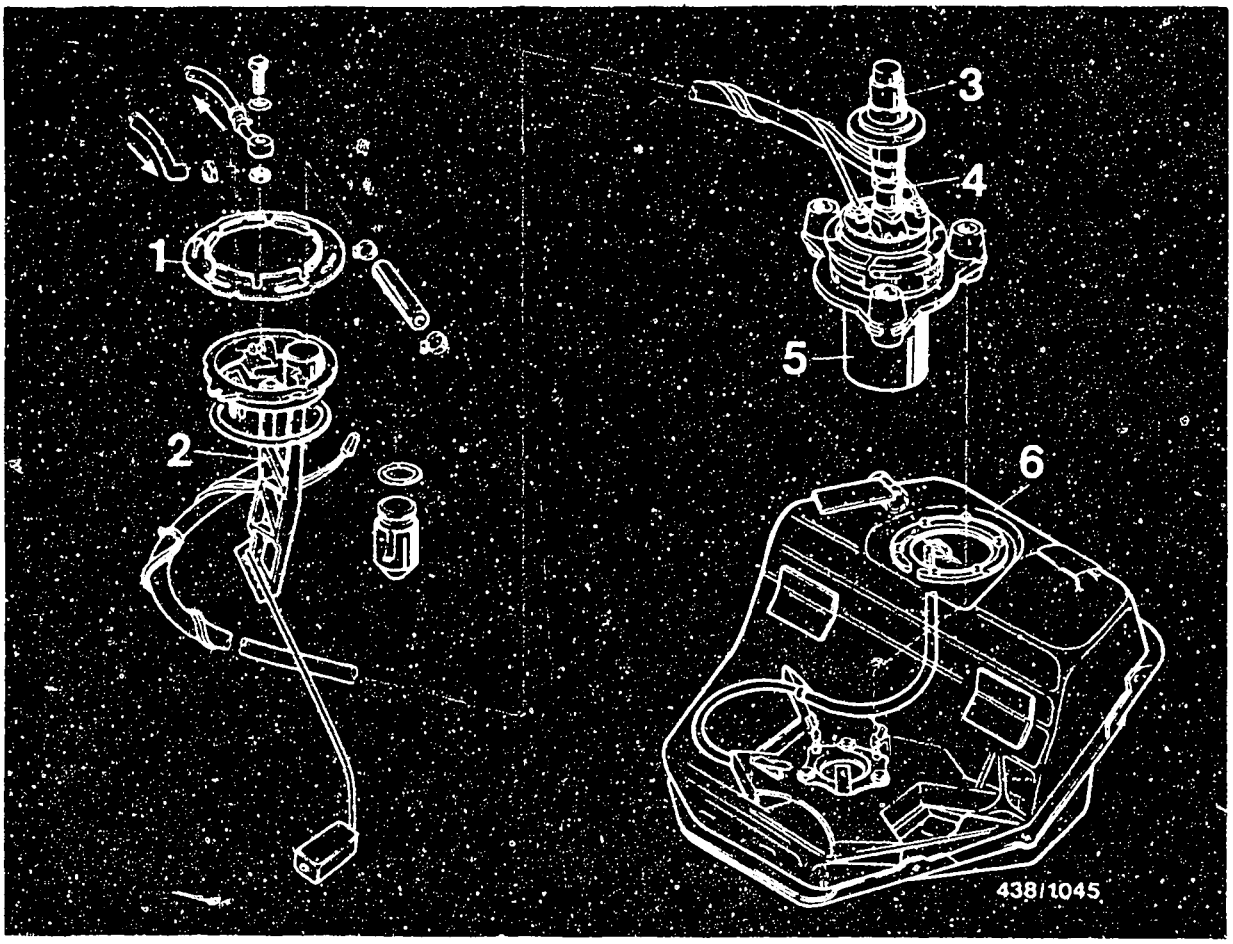
12.5 Possible causes of fuel delivery being too low

Power supply to electric fuel pump not in order, voltage drop.
Necessary minimum voltage across plug connector at closure ring (on top of fuel tank) = 11.5 V with electric fuel pump switched on.

Fuel filter heavily fouled.

If the above-mentioned points are O.K., the cause of the trouble is the electric fuel pump itself.

Replace electric fuel pump.

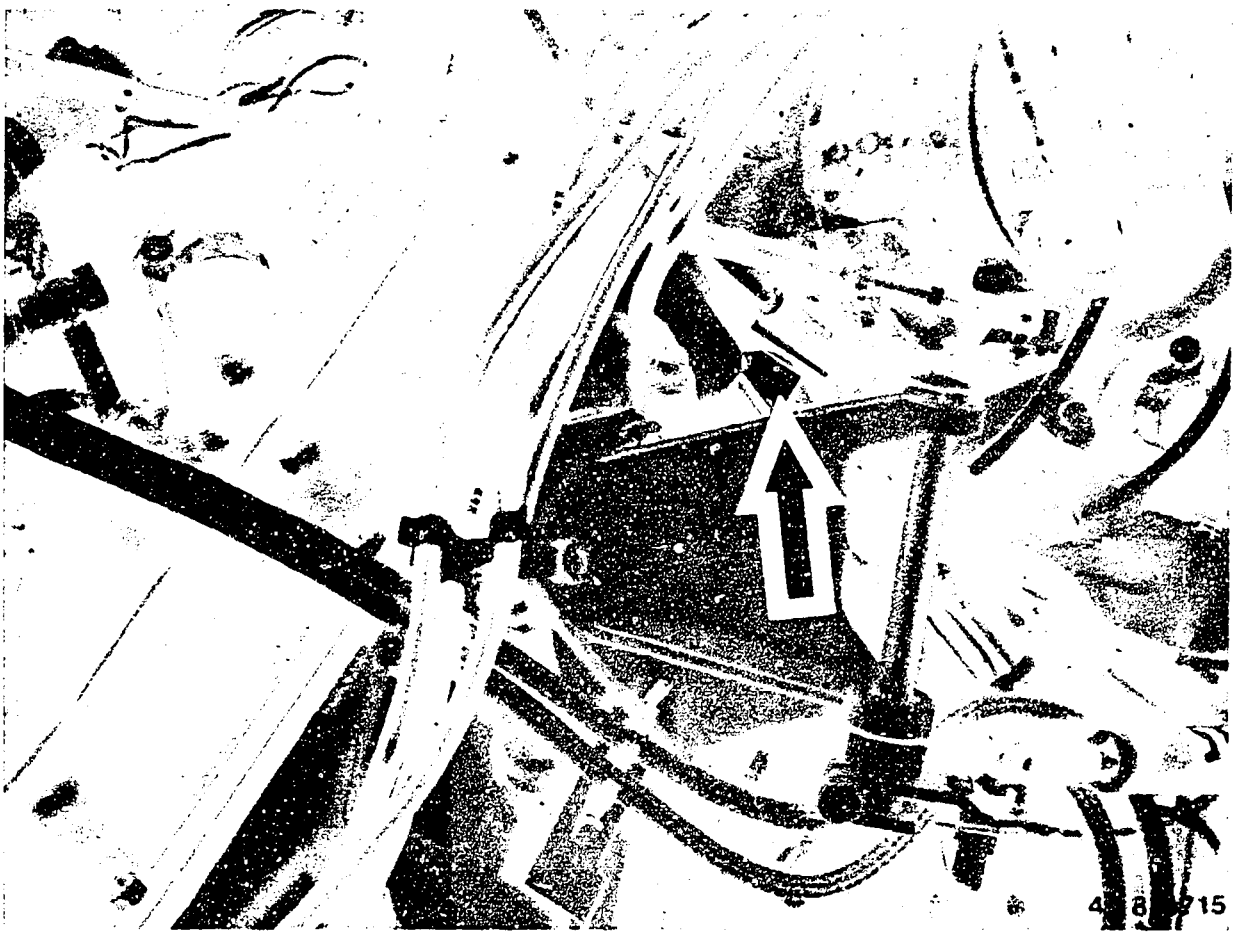


1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

12.6 Removing and installing the intank electric fuel pump on Audi 100 / 5E

Remove closure ring and take out fuel tank sender.
Withdraw complete unit (electric fuel pump, non-return valve and pressure damper) out of the ratchet springs on the base of the tank.
Replace electric fuel pump.

When installing, use a new seal and make sure that the electric fuel pump is correctly positioned.
Danger of kinking fuel lines.

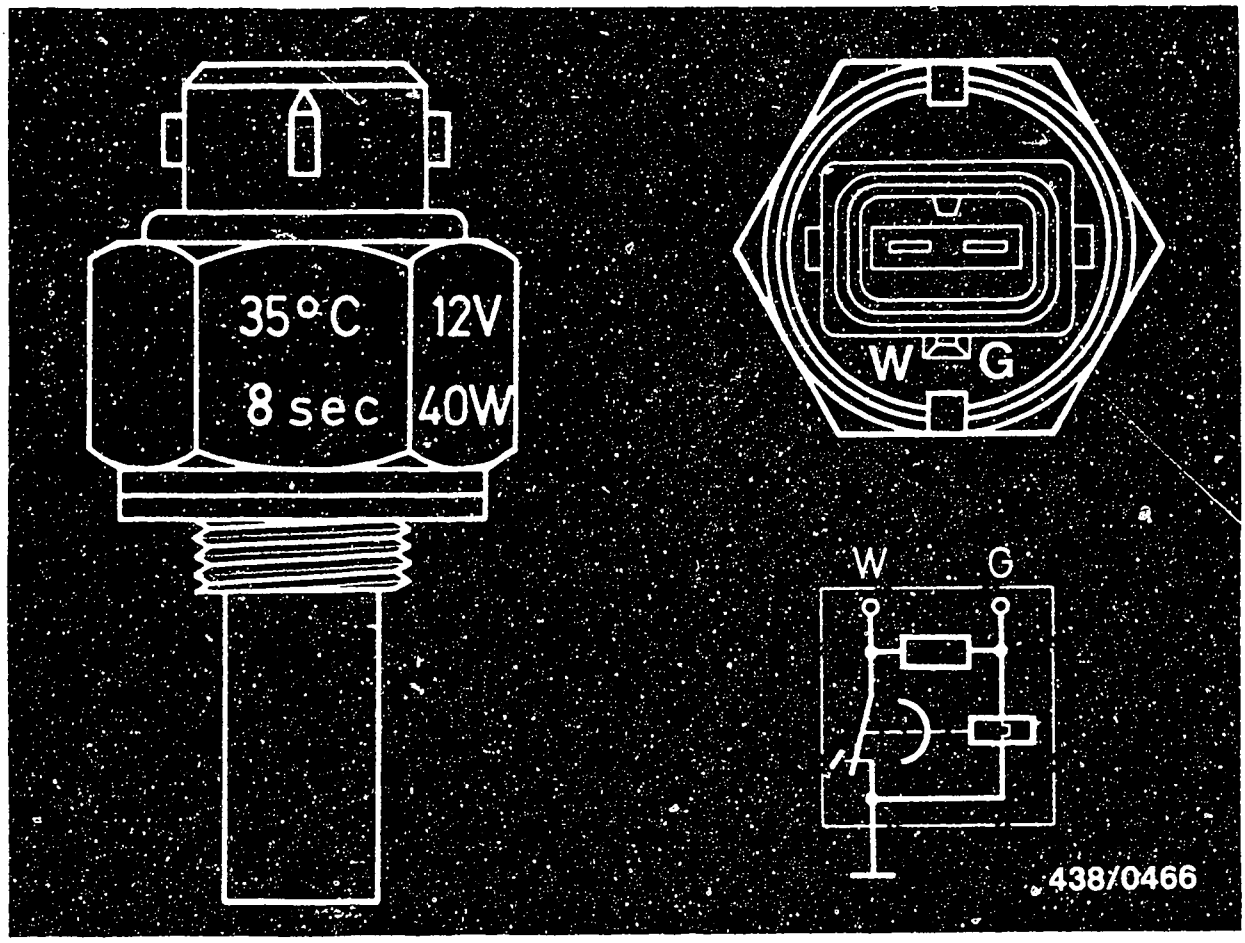


13. Checking the cold-starting system (thermo-time switch, start valve)

13.1 Thermo-time switch

The thermo-time switch (arrow) is screwed into the cylinder head at the rear underneath the ignition distributor.

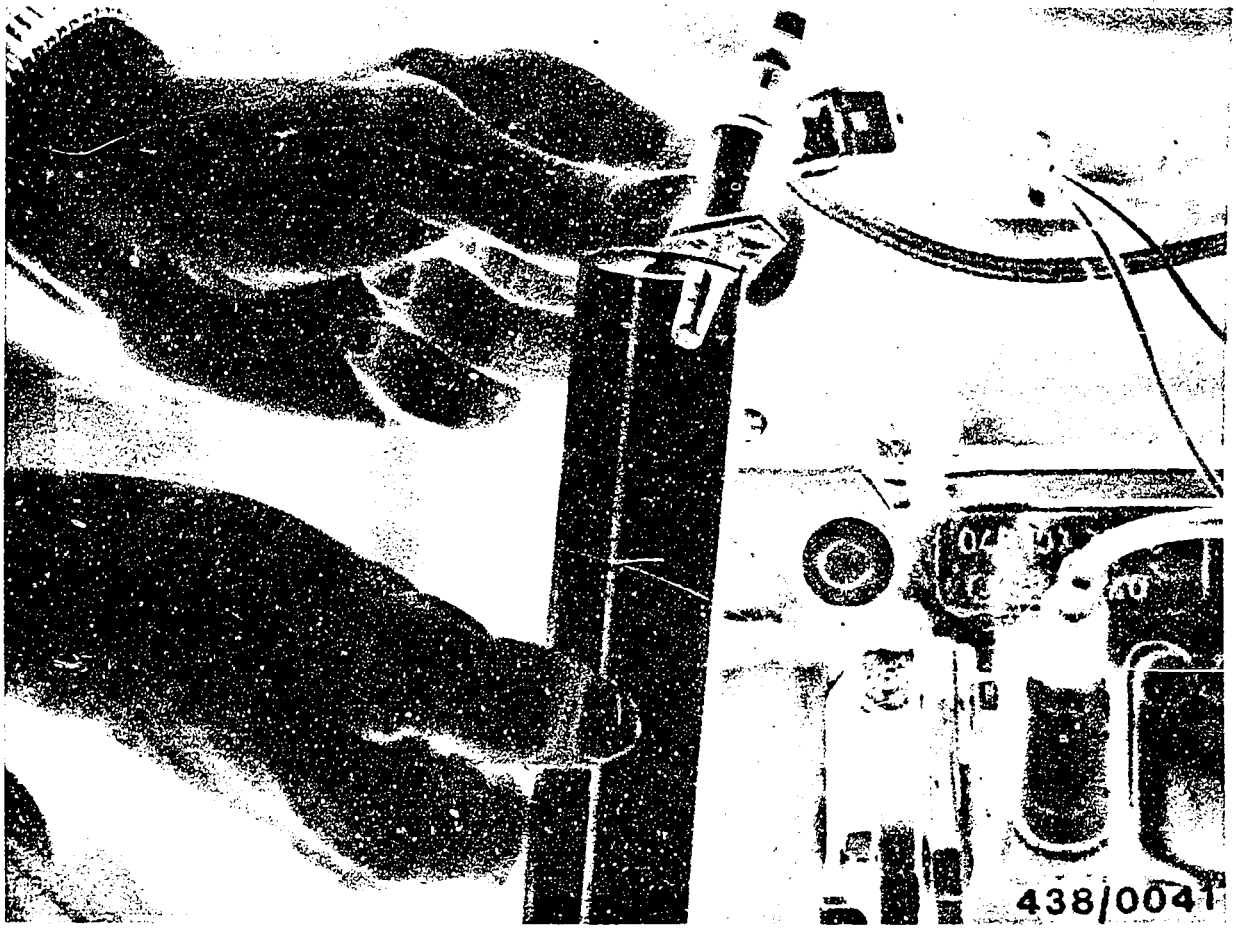
It must be removed for testing.
Catch any escaping coolant in a suitable vessel.



The switching temperature 35°C and the switching time at -20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and "W"
+30		25...40	0	25...40
	+40	50...80	100...160	50...80



13.2 Start valve

Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.

Important note:

During this test, do not let the connecting cable touch B +.

Danger of fire due to sparking!

Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.

Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

C A U T I O N !

Never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operating of the starting motor may lead to serious engine damage.

Switch on the ignition (max. 30 seconds). The start valve must now open and squirt fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 13.

14. Checking the control pressures

14.1 Preliminary remarks:

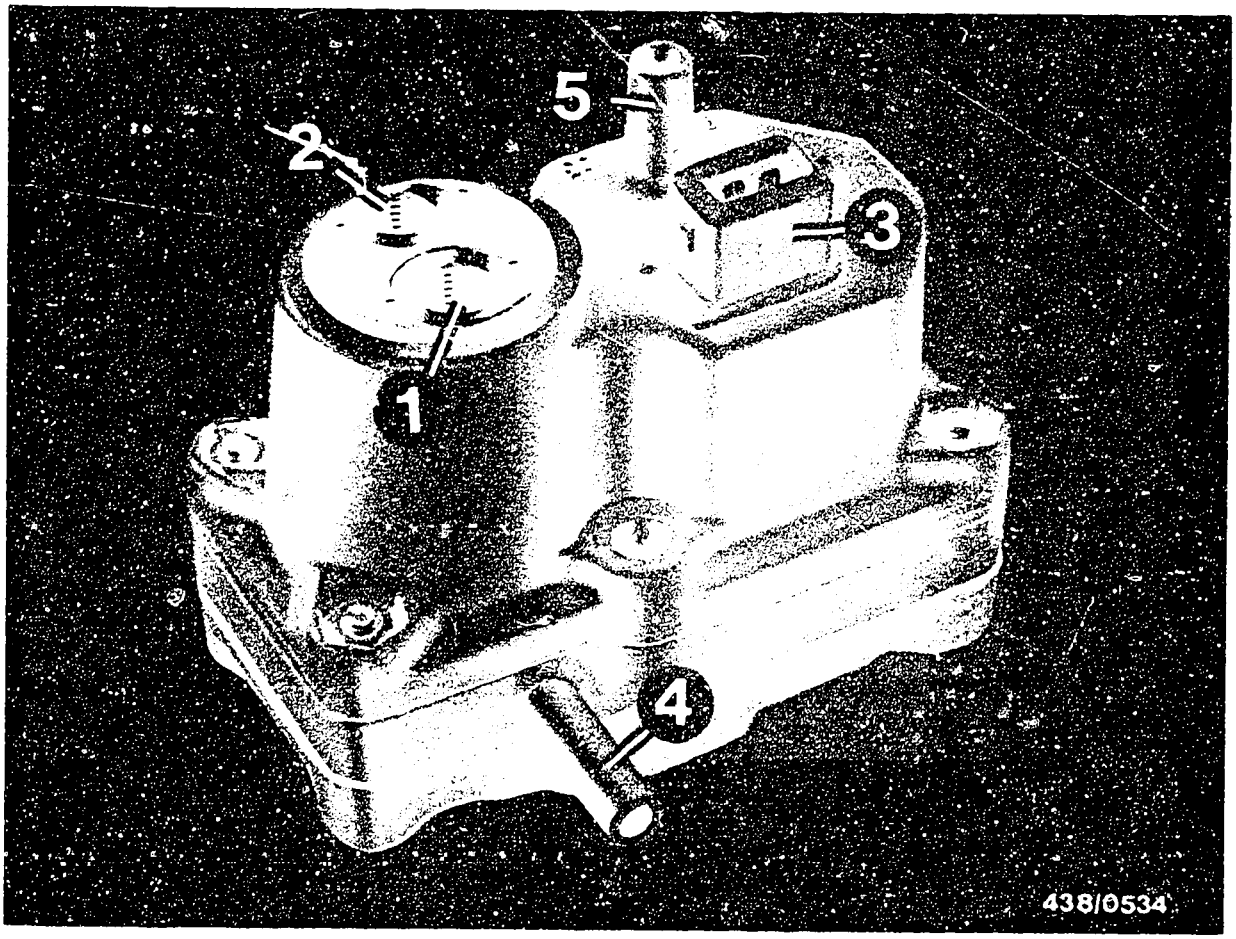
The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Fuel delivery for control-pressure circuit too low or too high.

  The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
  (Test specification: 160...240 cm^3/min).

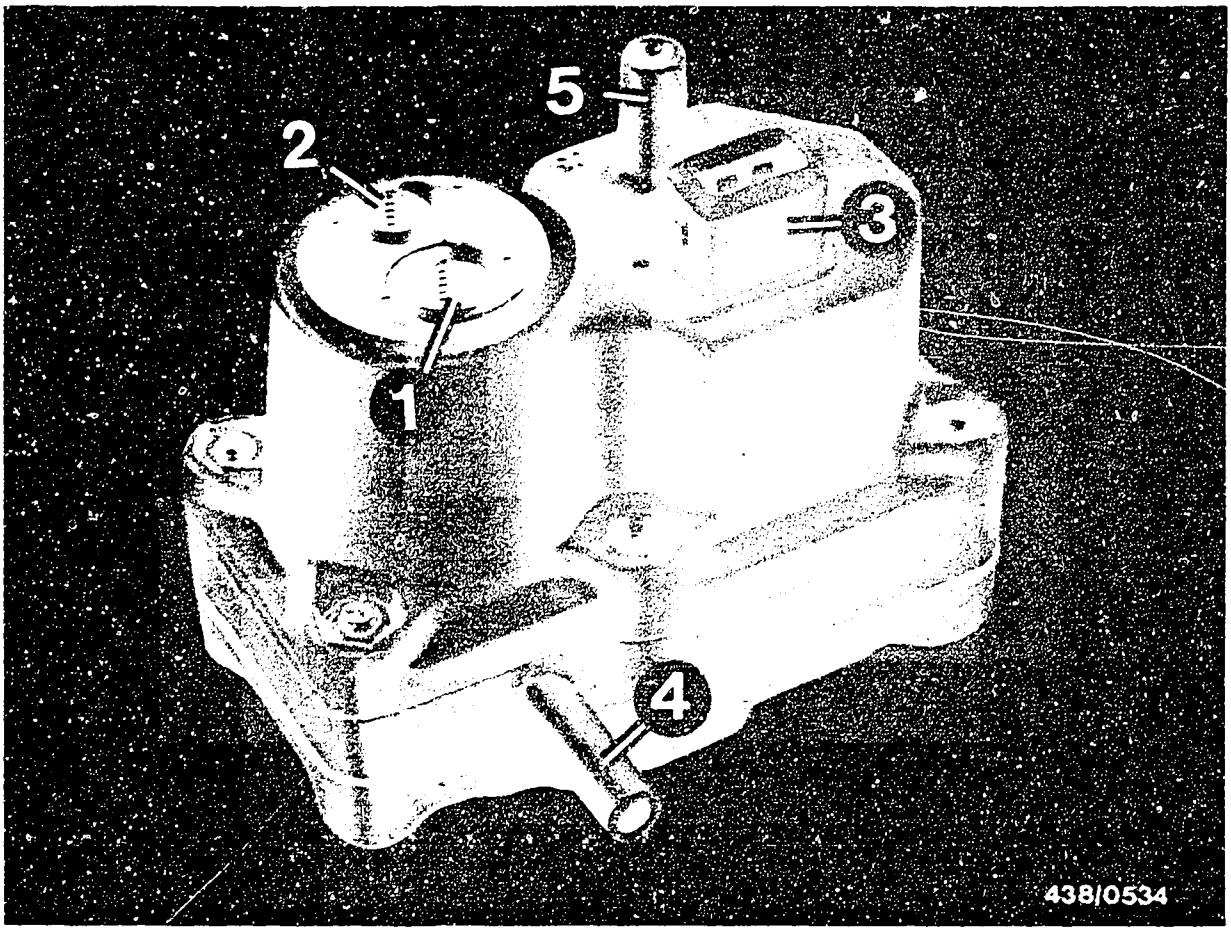
Reference is made to the other possible causes of trouble in the respective test step.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

- Warm-up regulator 0 438 140 113/ ... 114
  0 438 140 120/ ... 121

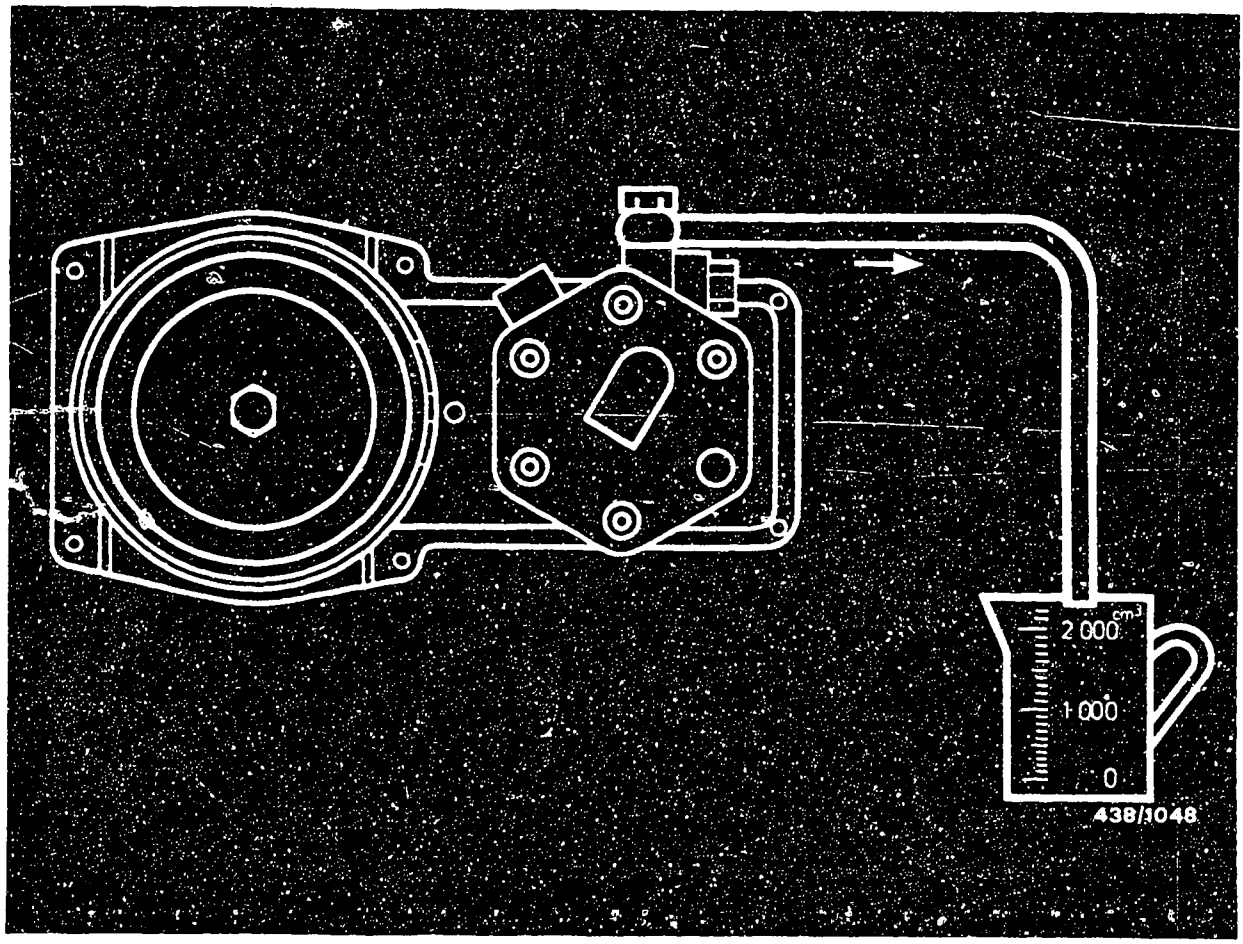
The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment disconnected from ambient-air pressure. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve)

The manifold-pressure connection port (4) is on the intermediate plate.

On the top side of the housing cover there is an atmospheric connection pipe (5) (protected against dirt by ventilated cap).

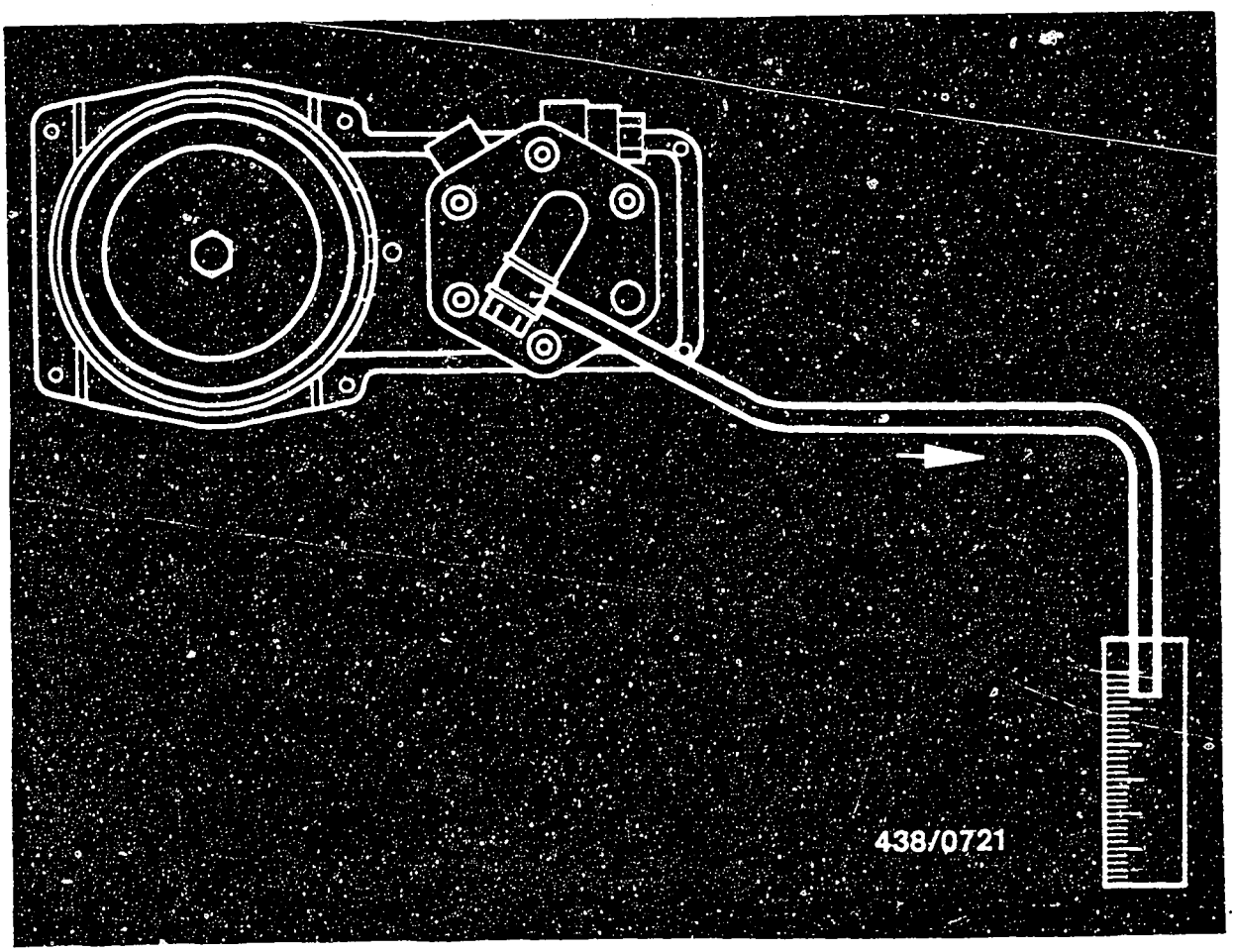


14.3 Testing the fuel delivery for the control-pressure circuit

Before testing, make sure that the electric fuel pump is in proper working order.

Test specification: Min. 850 cm^2/30s

As the measuring point, use the screw connector in the fuel return line to the fuel tank.



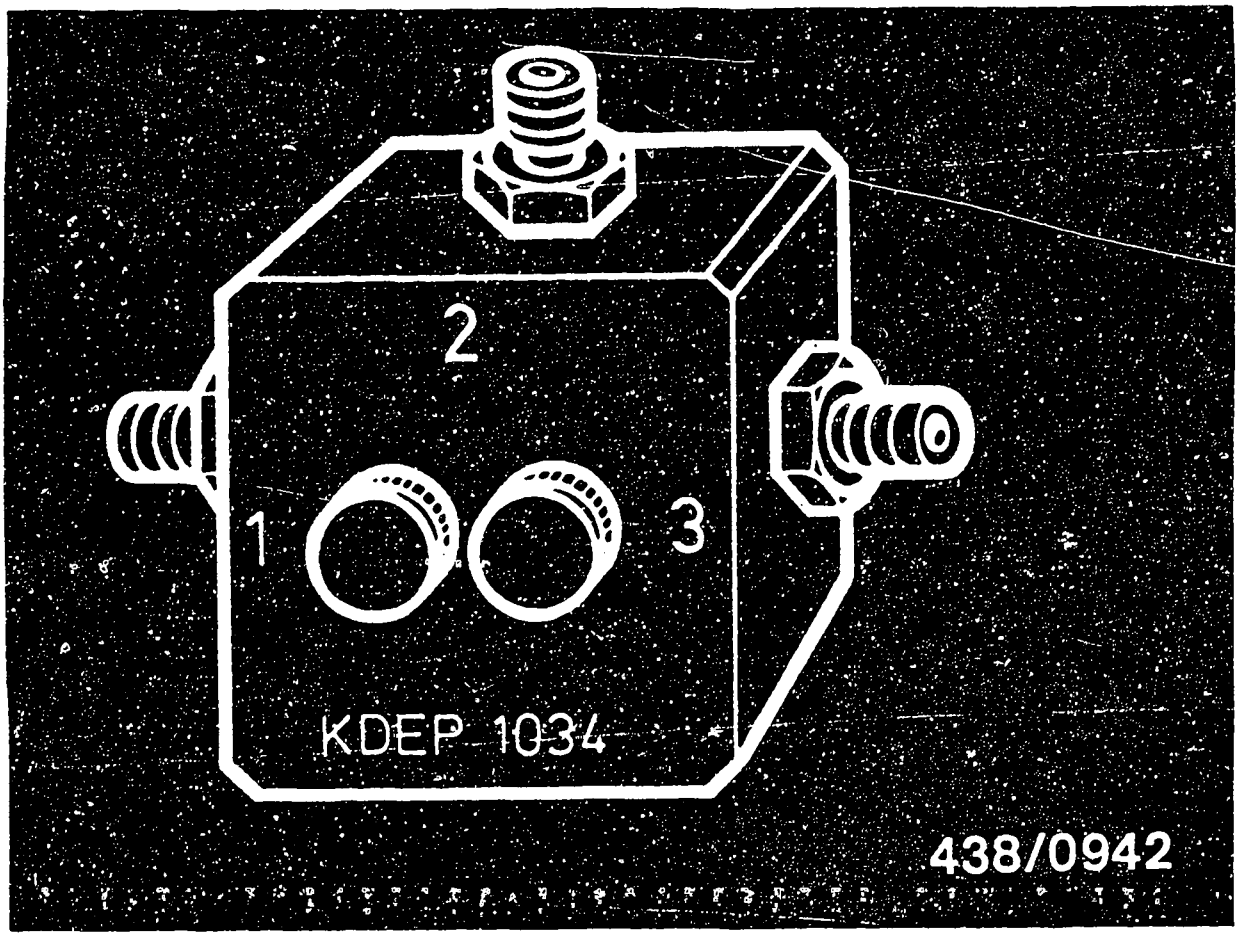
Unscrew control-pressure line (coming from fuel distributor) on warm-up regulator and hold end of hose in a graduate (approx. 0.5 l capacity).

Switch on the electric fuel pump for precisely one minute by bridging the electrical safety circuit and measure the fuel delivery.

Test specification: 160 ... 140 cm^3/min.

If the measured value is outside tolerance, the cause is the fuel distributor.

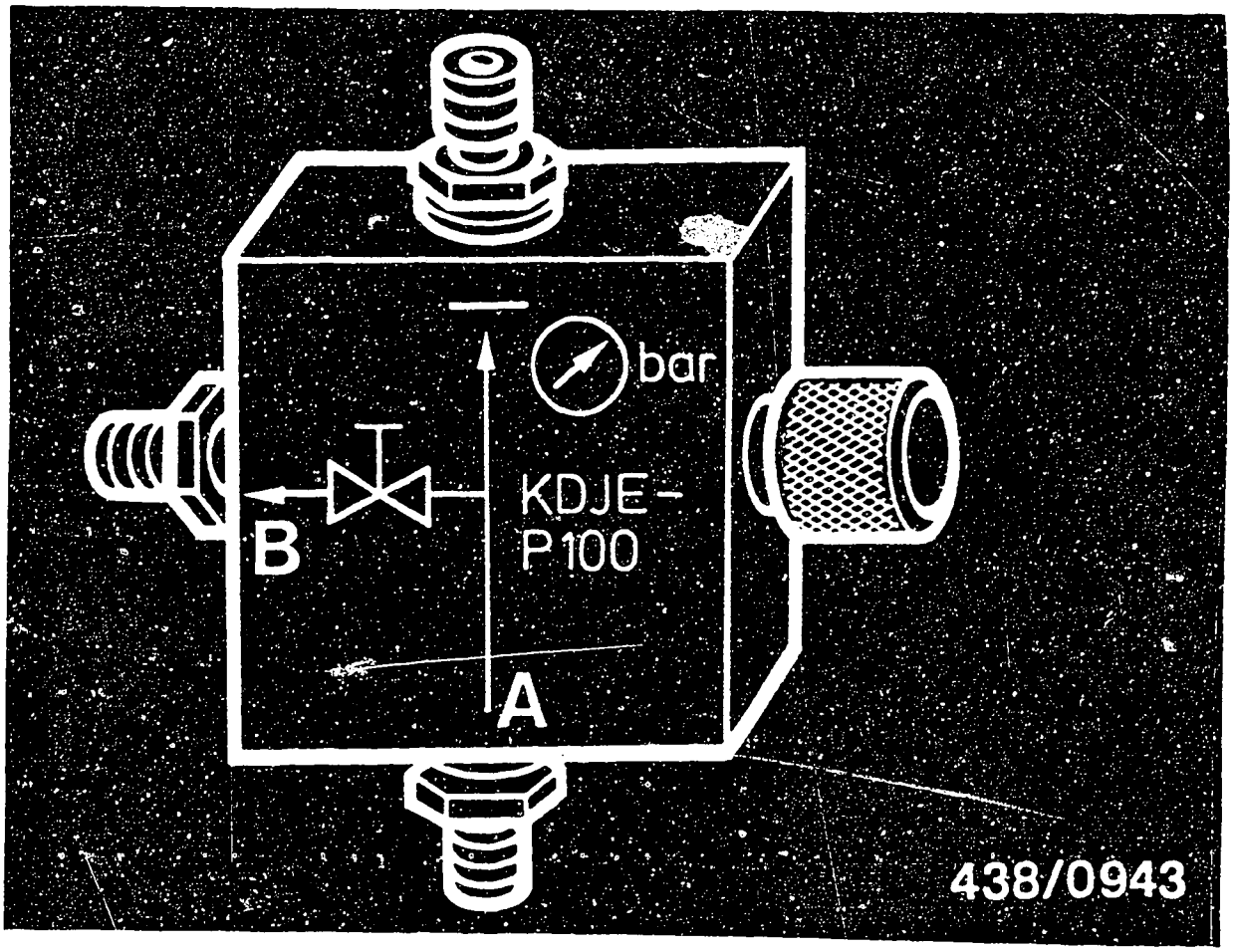
Replace fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034)

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws.

The connections of the directional-control valve are numbered.

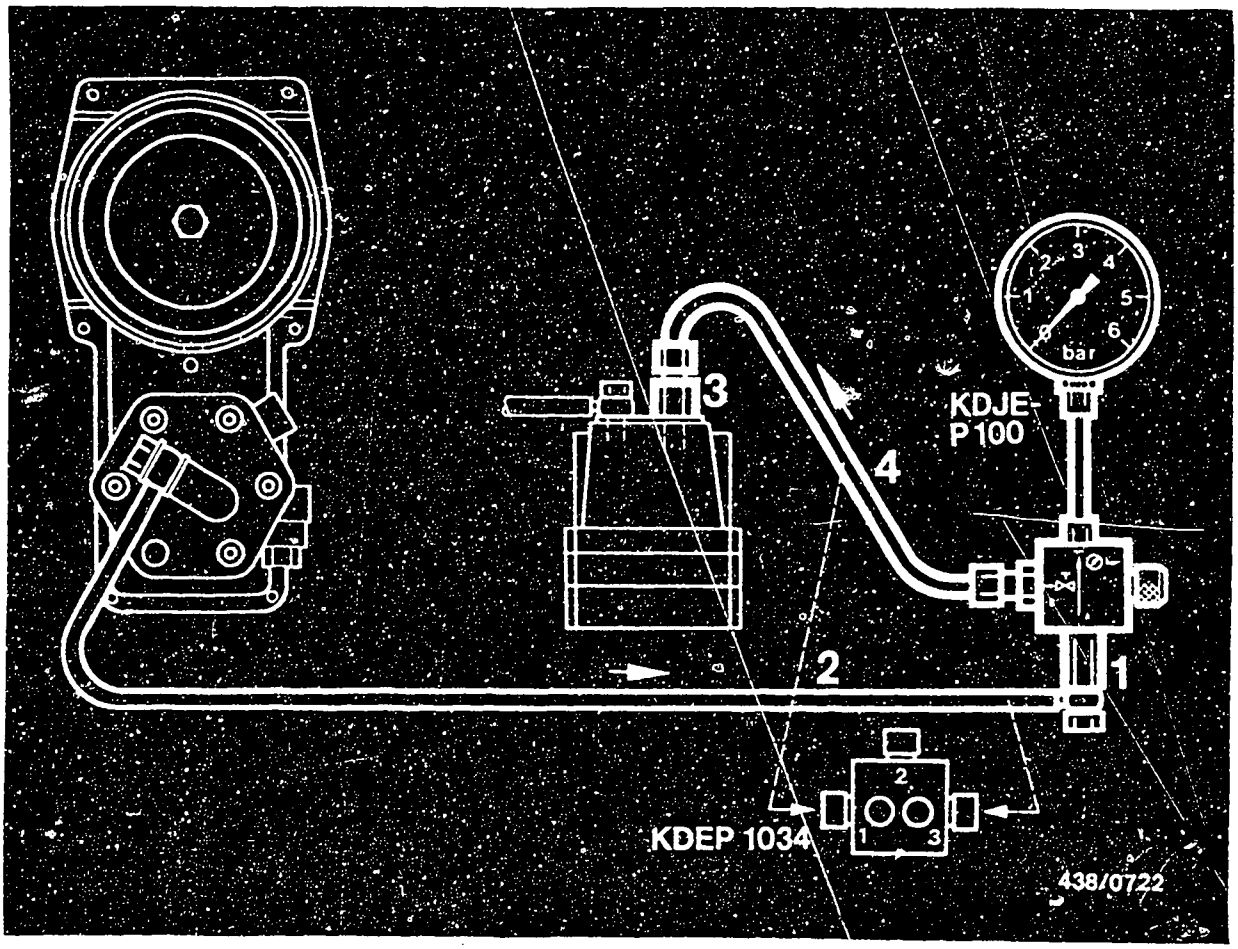


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw.

The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

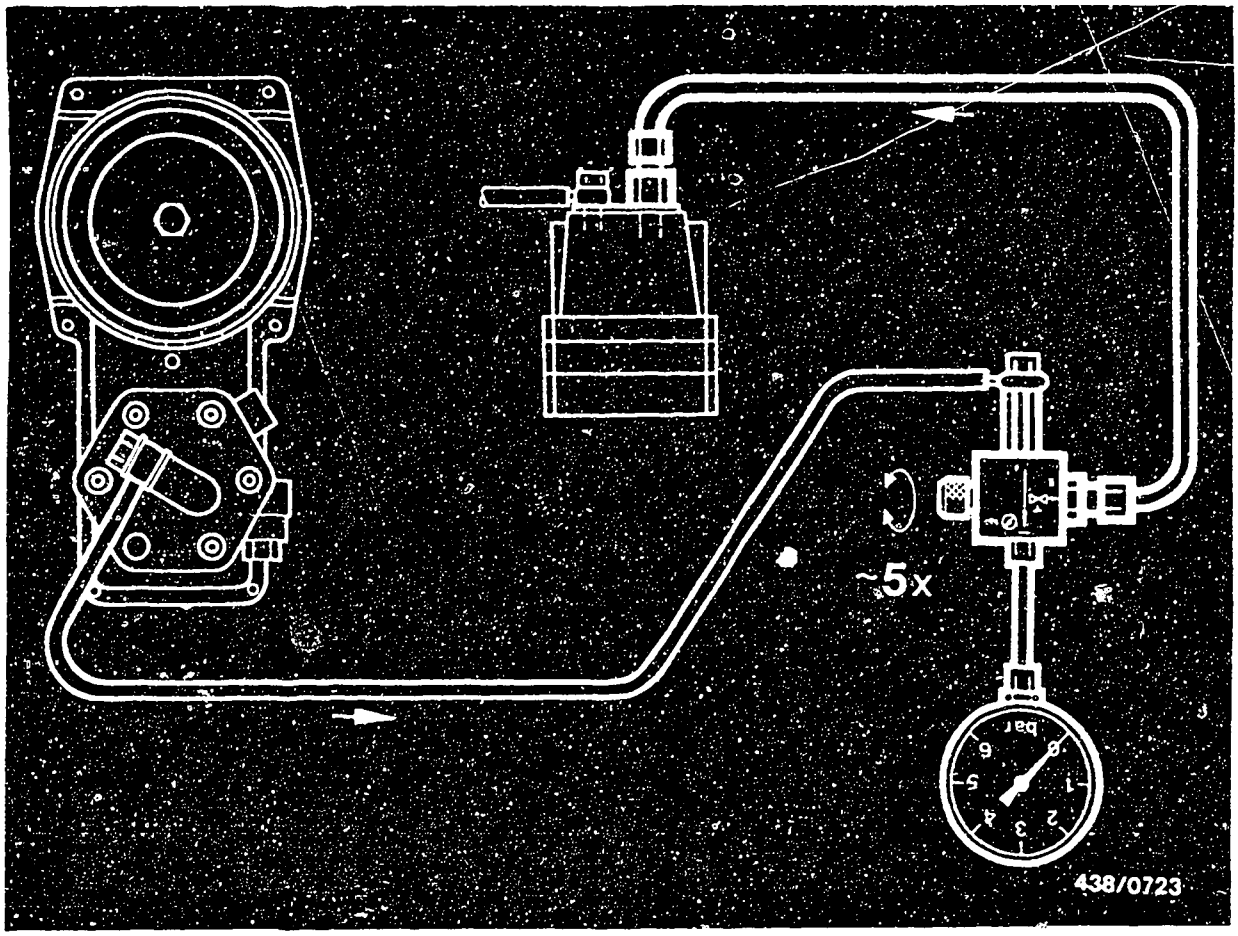
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/12.

- Screw the adapter (1) with seal onto inlet fitting A or 3 of the directional-control valve.
- Unscrew the control-pressure line (2) on the warm-up regulator and connect with inlet-union screw M 10 x 1 and seal rings to the adapter (1).
- Screw connecting piece (3) of connecting-parts set into inlet of warm-up regulator and, using hose line (4), connect to outlet fitting B or 1 of the directional-control valve.

Suspend the pressure gauge from the engine hood (possibly using a wire hook).



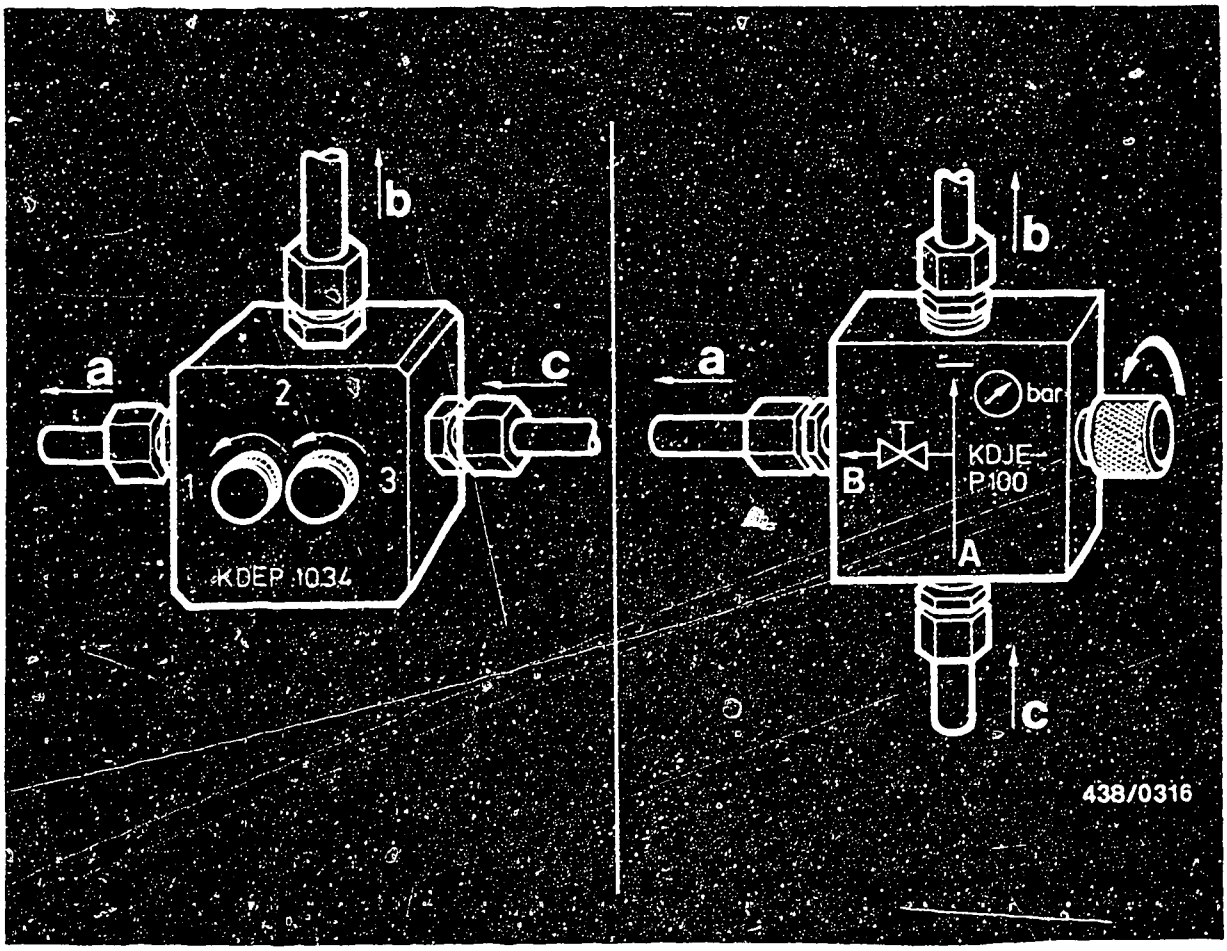
14.5 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

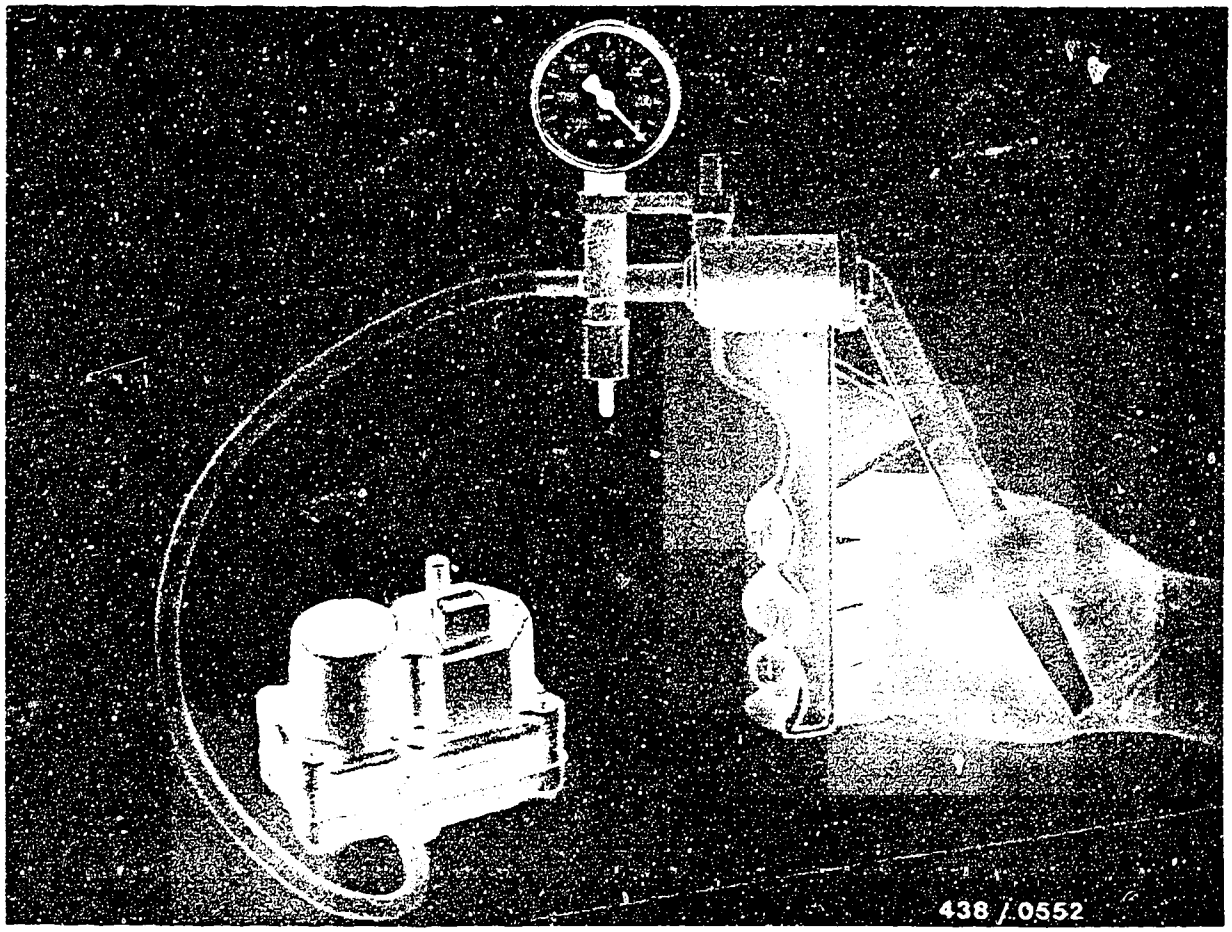
14.6 Testing the "cold" control pressure

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

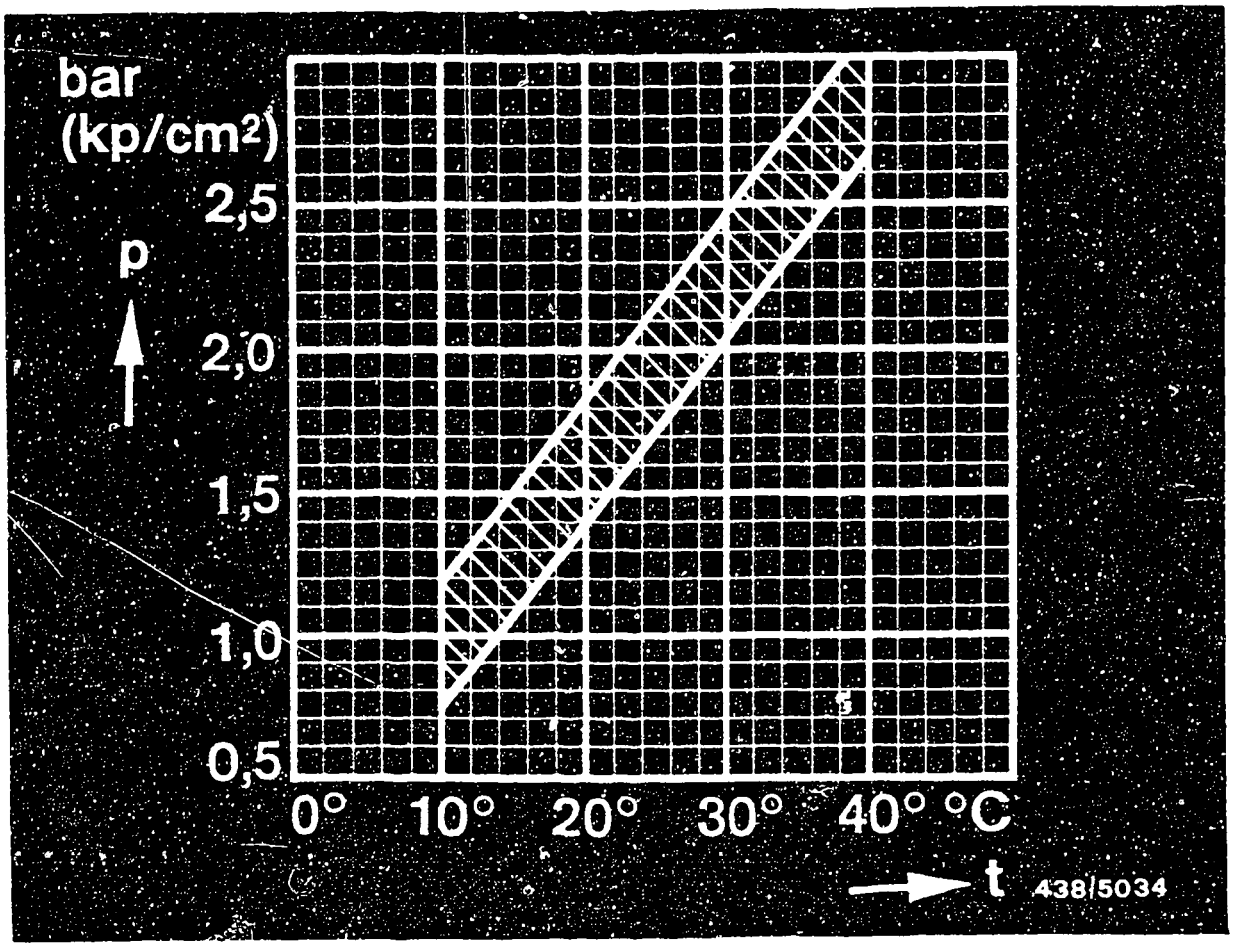


Part no. of warm-up regulator: 0 438 140 113/ ... 114
0 438 140 120/ ... 121

The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 400 ..600 mbar
(300...450 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.

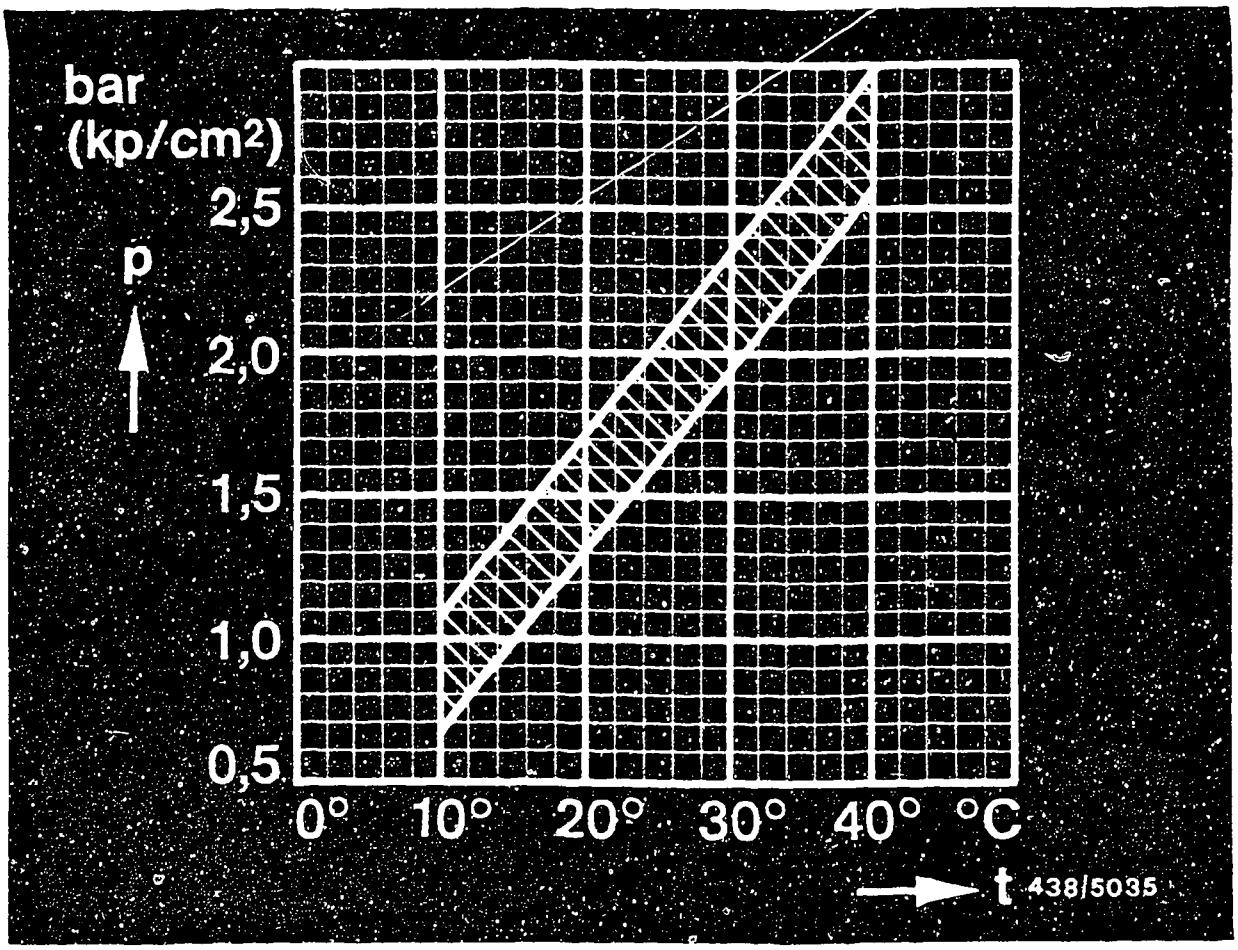


p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 113
0 438 140 114

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20°C
Nominal control pressure = 1.4...1.8 bar gauge pressure



p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 120
0 438 140 121

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20°C
Nominal control pressure = 1.3...1.7 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, it may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or restricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has been replaced or a defect has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F 13.

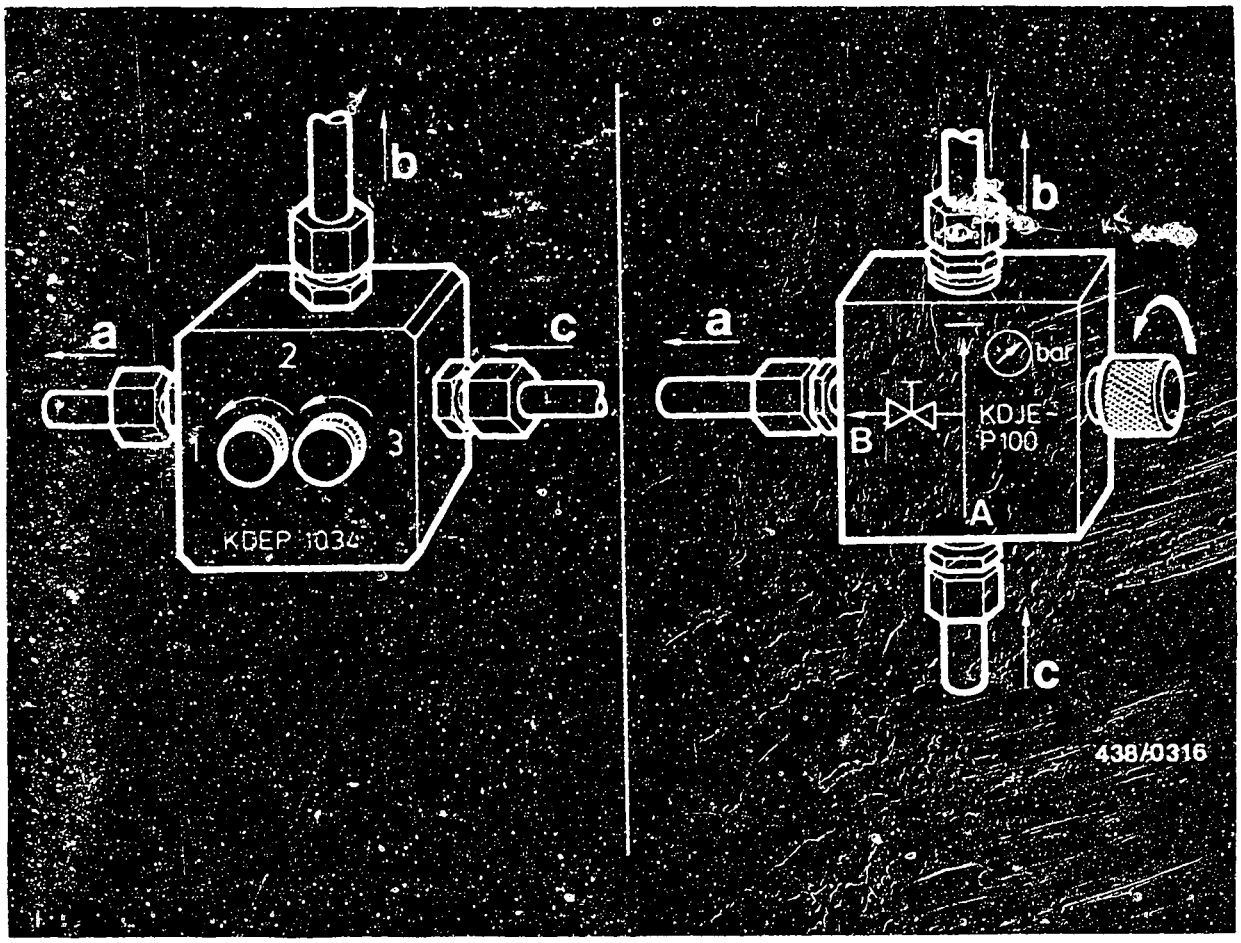
Note:

The above-described control-pressure test tells you whether the control-pressure circuit and warm-up regulator are O.K.

Incorrect control-pressure functions during vehicle operation may, however, also be due to a malfunction in the manifold pressure control system for the warm-up regulator.

This system must be tested with the engine at normal operating temperature and running. Therefore, it is best to combine the test with the final idle adjustment.

Idle adjustment is described on Coordinate F6.



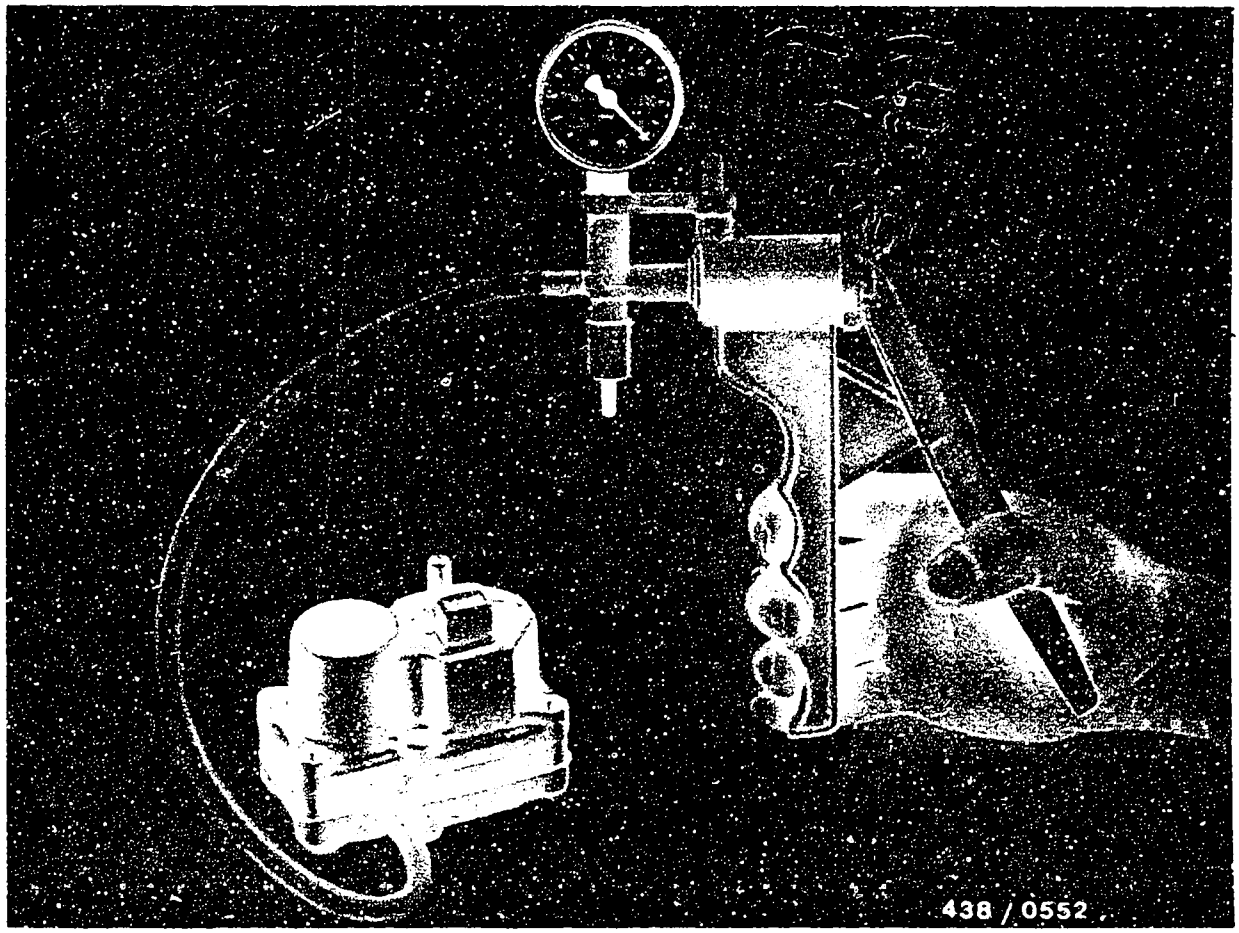
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 113/ ... 114
0 438 140 120/ ... 121

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 400...600 mbar
(300...450 torr)

Test procedure:

Engine temperature is not important.

Open hollow screw of directional-control valve (both screws on KDEP 1034).

Switch on electric fuel pump by bridging the electrical safety circuit.

Connect plug to warm-up regulator.

Control pressure now rises (warm-up regulator in the process of shutting off) until "warm" control pressure is reached.

Firstly, test without manifold pressure, then with simulated manifold pressure (vacuum) according to the figures below:

Test step	Test specifications *
• Control pressure "warm"	
Test with atmospheric pressure (without vacuum) Warm-up regulator part no.:	
0 438 140 113/...114	2.7 ... 3.1 bar (2.8 ... 3.2 kgf/cm²)
0 438 140 120/...121	
For testing, connect vacuum pump to manifold-pressure connection on warm-up regulator. Setting value: 400...600 mbar (300...450 mmHg) Warm-up regulator part no.:	
0 438 140 113/...114	4.0 ... 4.4 bar (4.1 ... 4.5 kgf/cm²)
0 438 140 120/...121	3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following possible faults:

If control pressure too high:

- Fuel delivery for control-pressure circuit too high.
  Test the fuel delivery.
  Test specification: 160 ... 240 cm³/min.

- Fuel return from warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator hydraulically defective.
  Replace warm-up regulator.

If the warm-up regulator has failed through fouling, provide the new warm-up regulator with tube fitting 1 433 356 802. Tightening torque 20 ... 22 Nm (2.0 ... 2.2 kgfm).

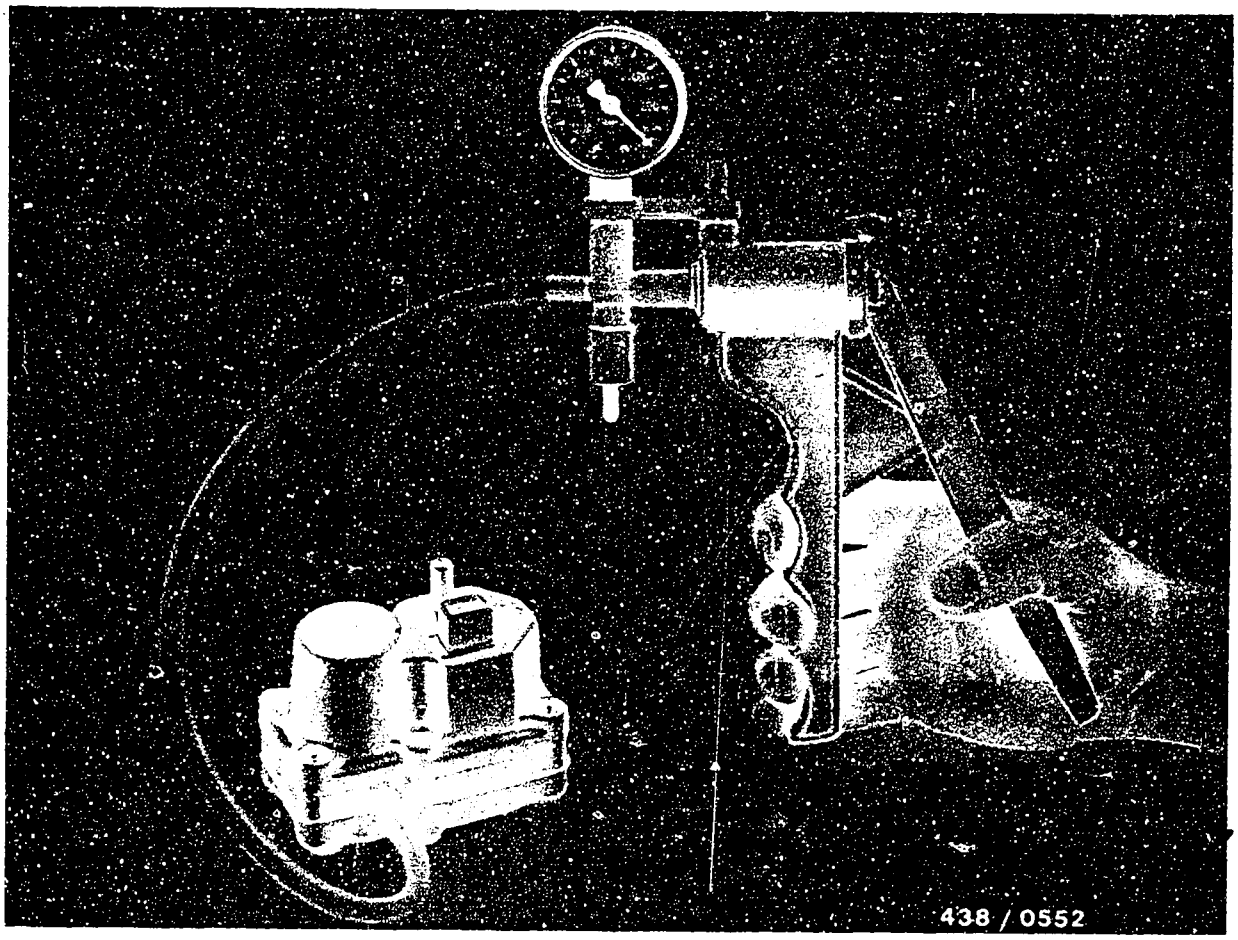
If control pressure too low:

- Power supply open circuit.
  Eliminate open circuit. Ensure proper contact at plug.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage across connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the alternator voltage of approx 14 V which is normal during vehicle operation.

- Fuel delivery for control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160 ... 240 cm³/min.

- Warm-up regulator defective. Heating coil open circuit. Hydraulically defective. Replace warm-up regulator.



14.8 Testing the full-load diaphragm for leaks

Switch off the electric fuel pump.

Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.
Setting value: 400...600 mbar (300...450 mmHg)

Test specification for air leaks:
Max. pressure drop within 15 s 100 mbar (75 mmHg)

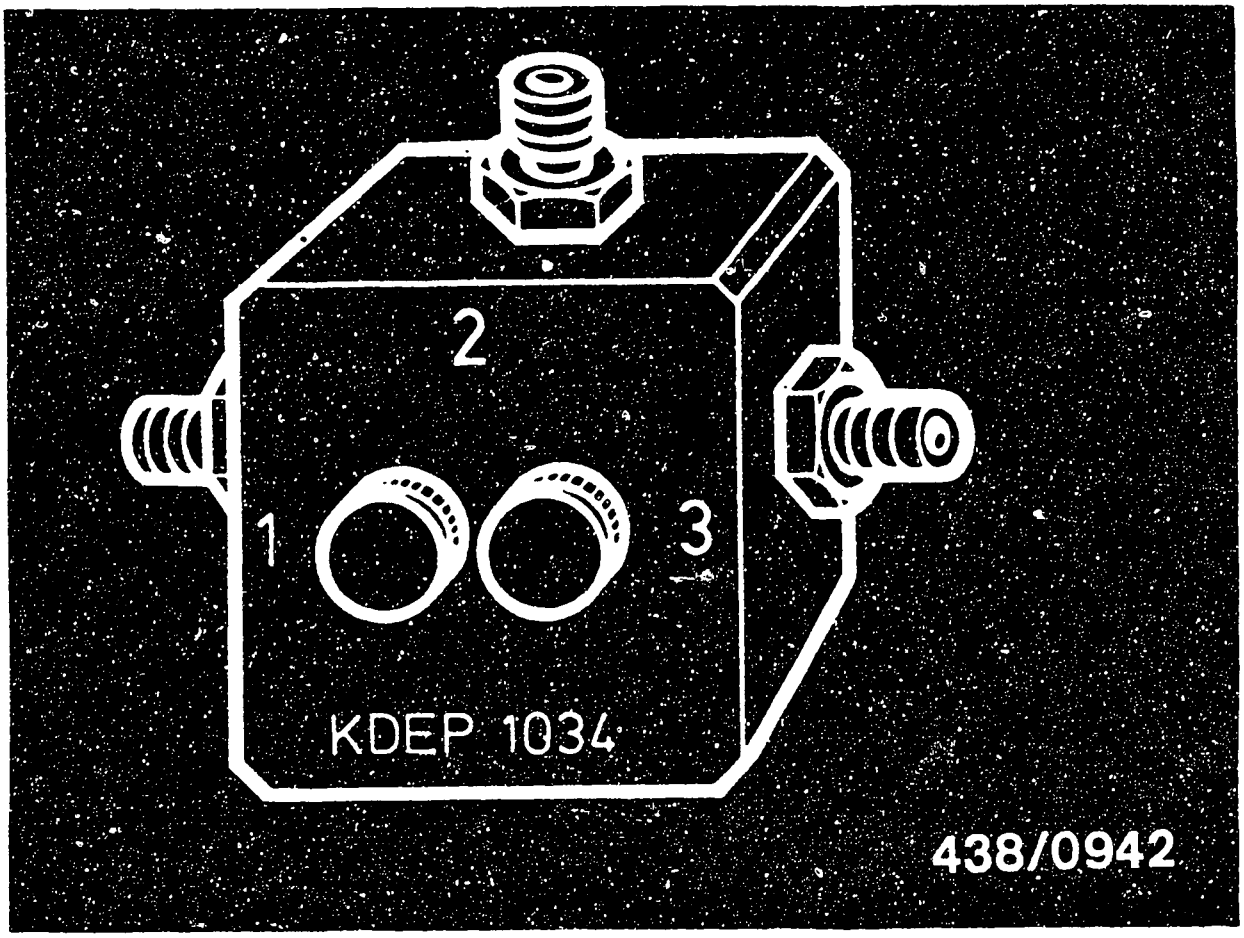
If the pressure drop is too great, replace the warm-up regulator.

Note:

Incorrect control-pressure functions during vehicle operation may also be due to a malfunction in the intake-manifold-pressure control system for the warm-up regulator.
Therefore, check the condition and correct installation of the connecting hose from the intake manifold to the warm-up regulator. Check the system with the engine running and at normal operating temperature. This test is best combined with the final idle adjustment.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

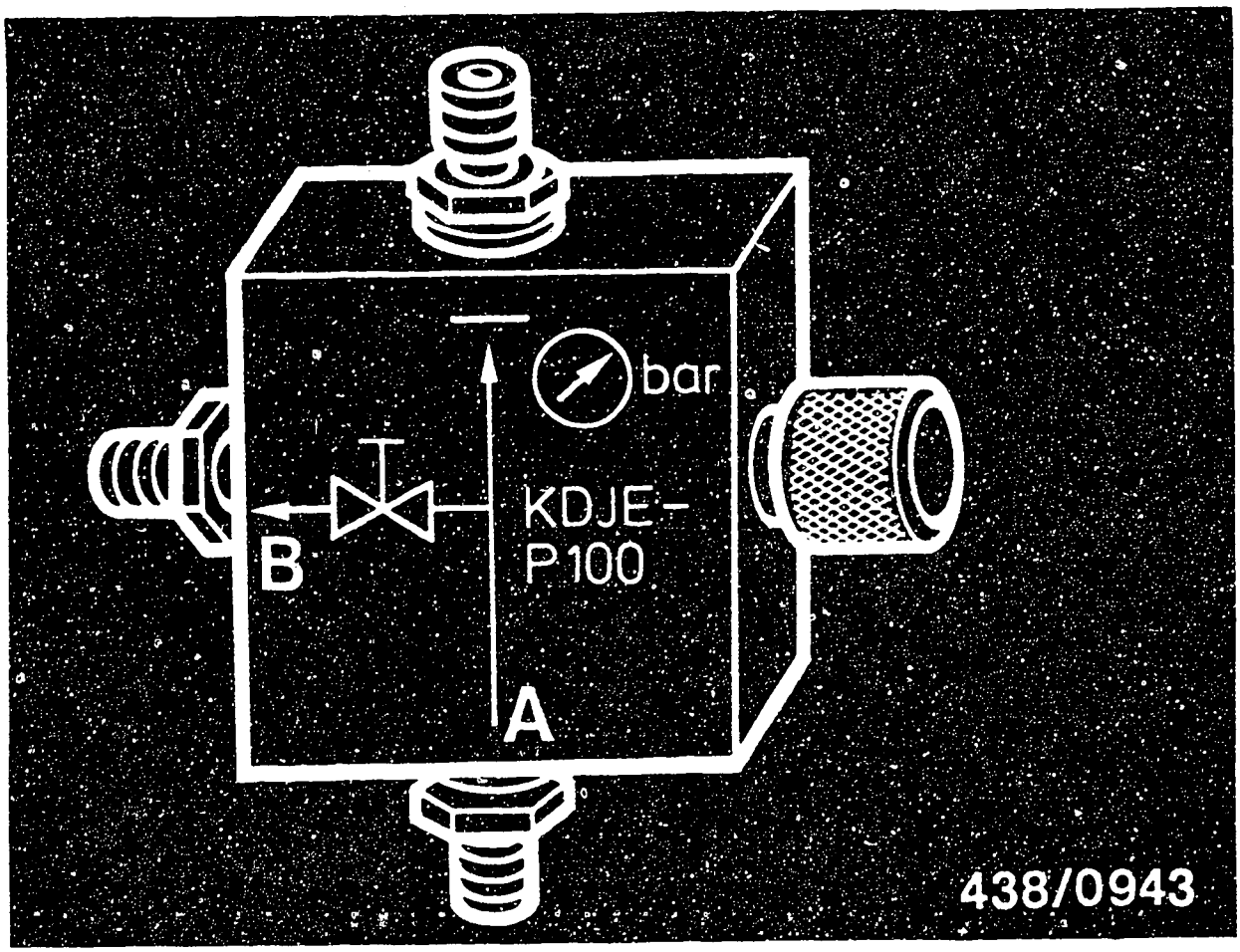
Idle adjustment is described on Coordinate F 13.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

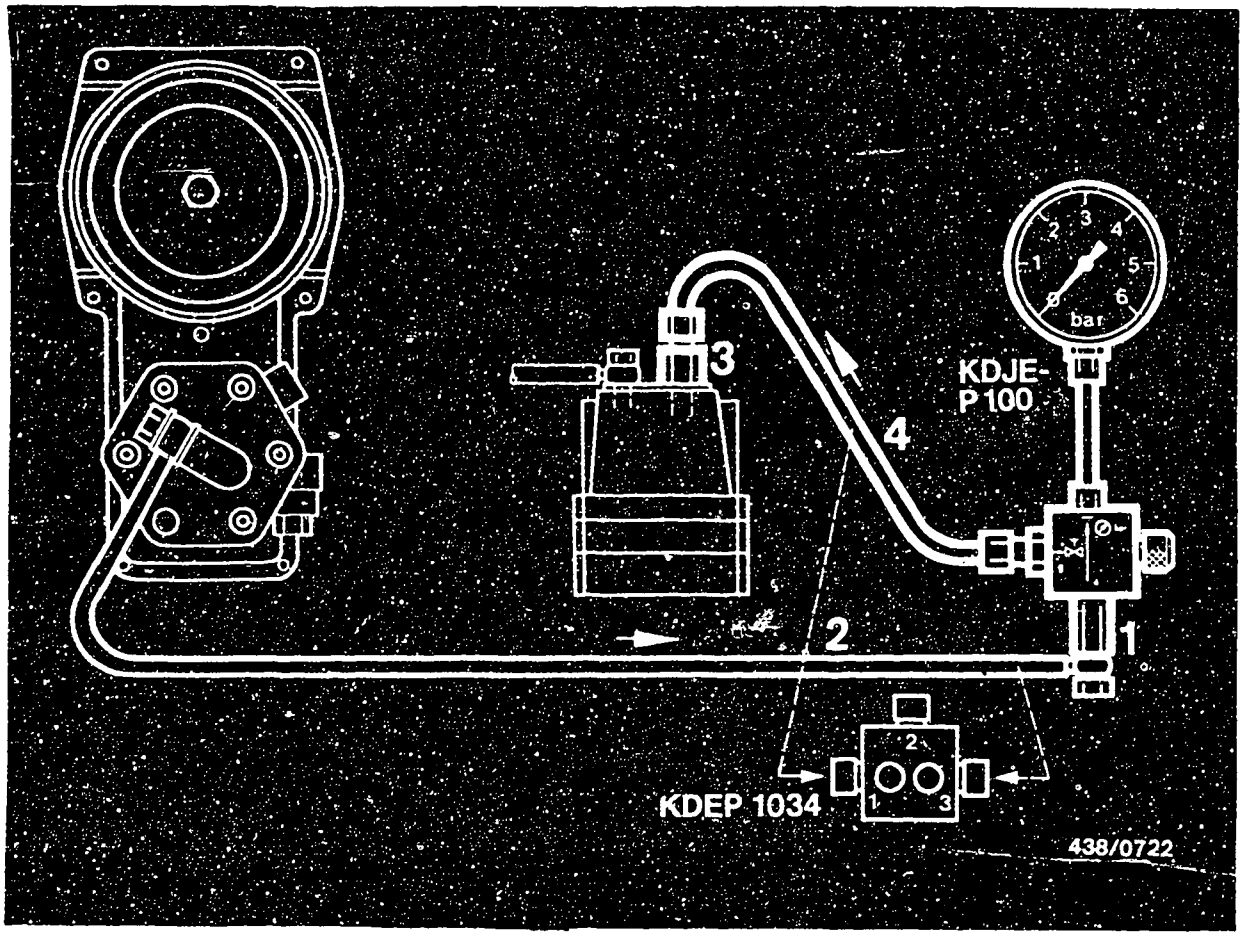
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

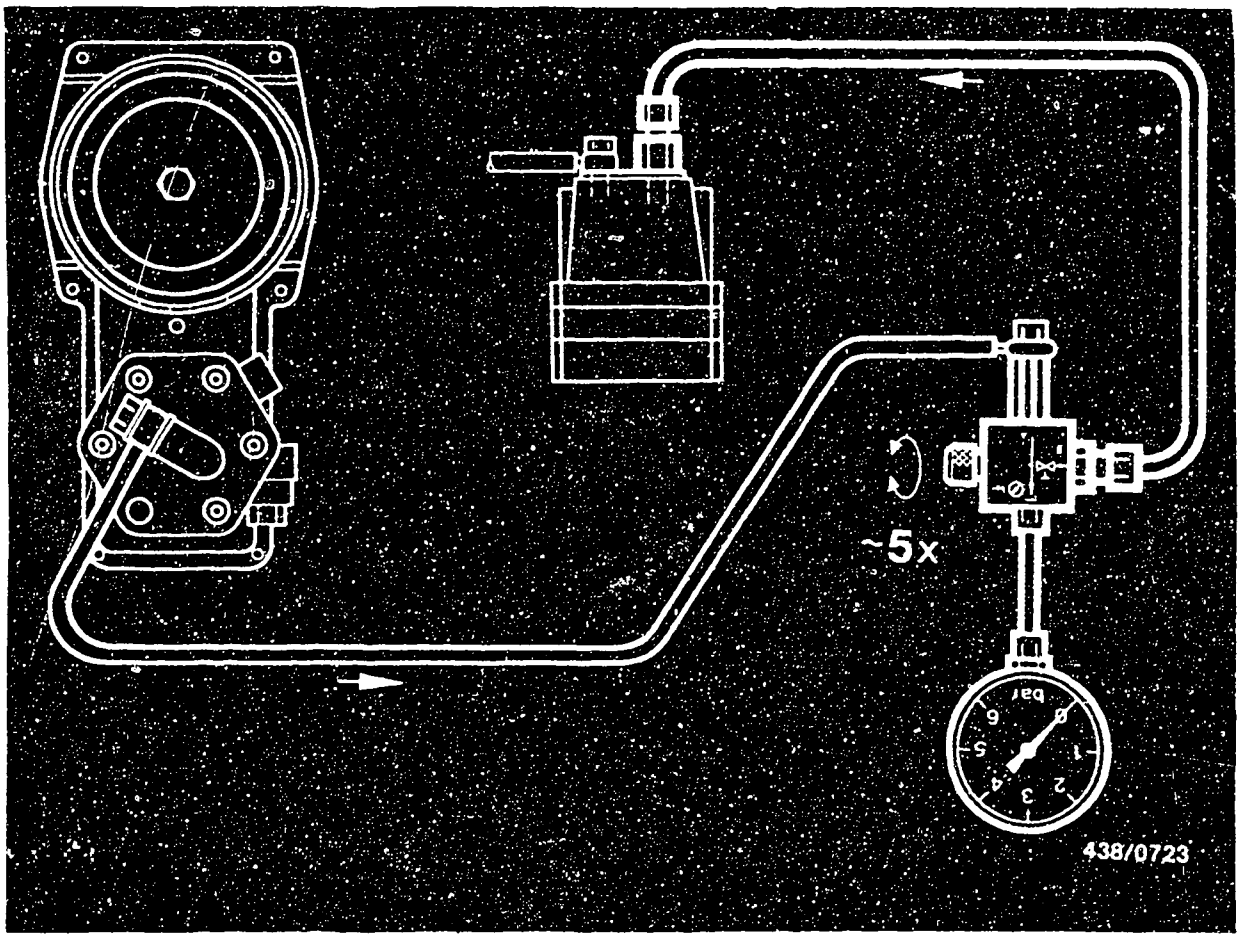
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/12.

- Screw the adapter (1) with seal onto inlet fitting A or 3 of the directional-control valve.
- Unscrew the control-pressure line (2) on the warm-up regulator and connect with inlet-union screw M 10 x 1 and seal rings to the adapter (1).
- Screw connecting piece (3) of connecting-parts set into inlet of warm-up regulator and, using hose line (4), connect to outlet fitting B or 1 of the directional-control valve.

Suspend the pressure gauge from the engine hood (possibly using a wire hook).



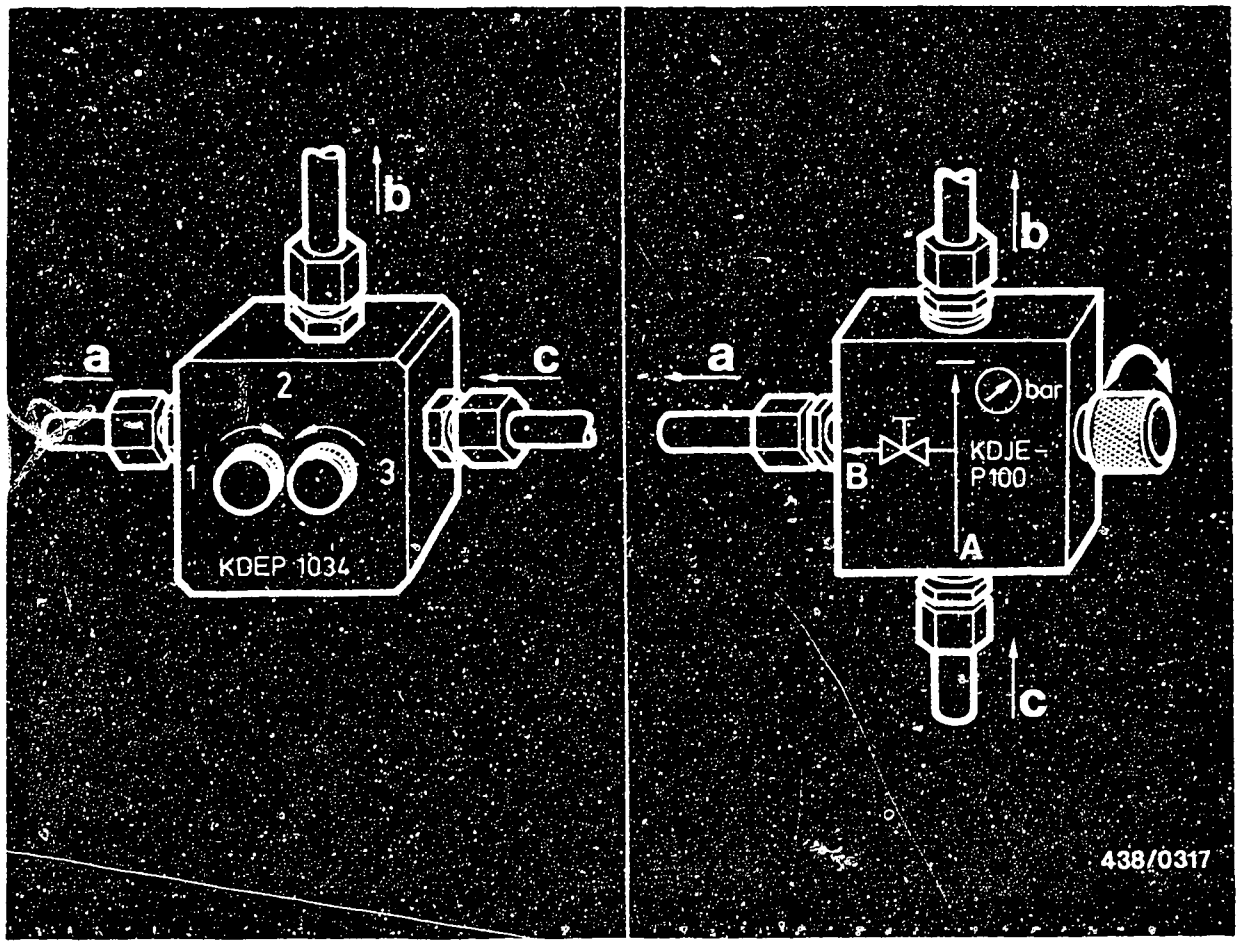
15.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important. Close the valve screw of directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 125 0 438 100 126	4.7...5.4 bar (4.8...5.5 kgf/cm²)

Possible causes for too low a primary pressure:

- Fuel supply faulty
(Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.

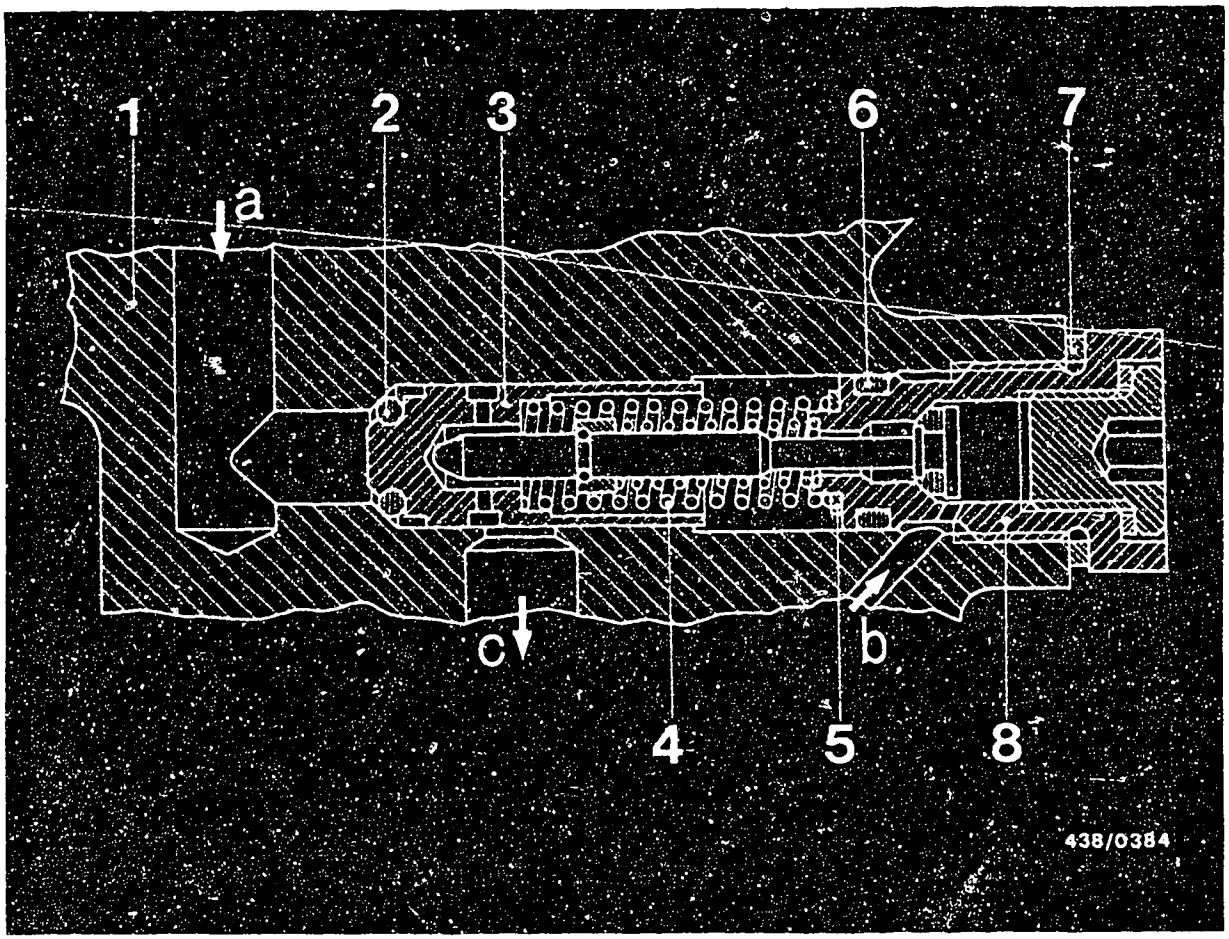
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
Measure the fuel delivery. (Test specification: 950 cm³/ 30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.

For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.

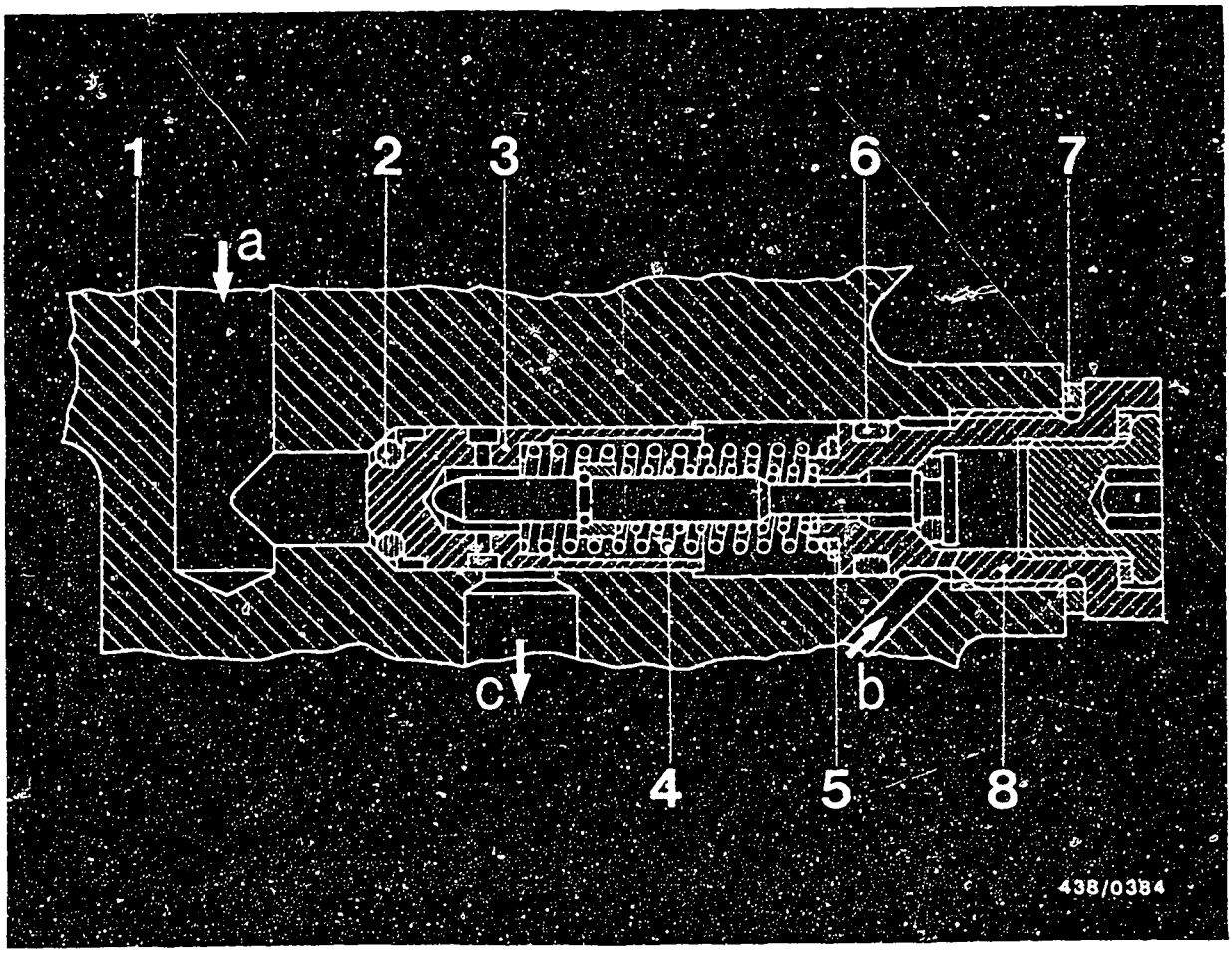


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped ring (formerly O-ring)
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

15.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 125 0 438 100 126	4.9...5.1 bar (5.0...5.2 kgf/cm²) gauge pressure

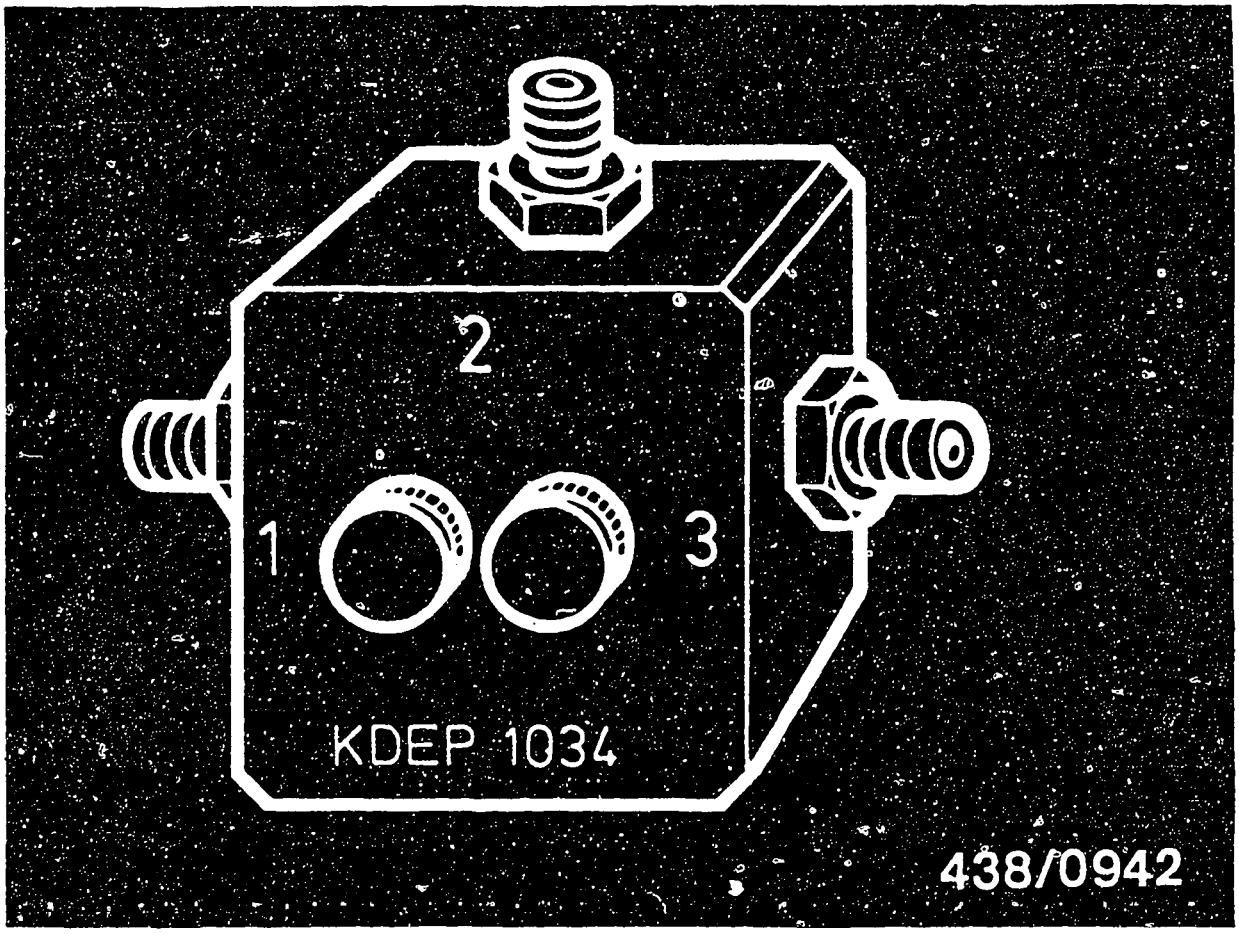


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 7) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 6) and O-ring (Item 8).

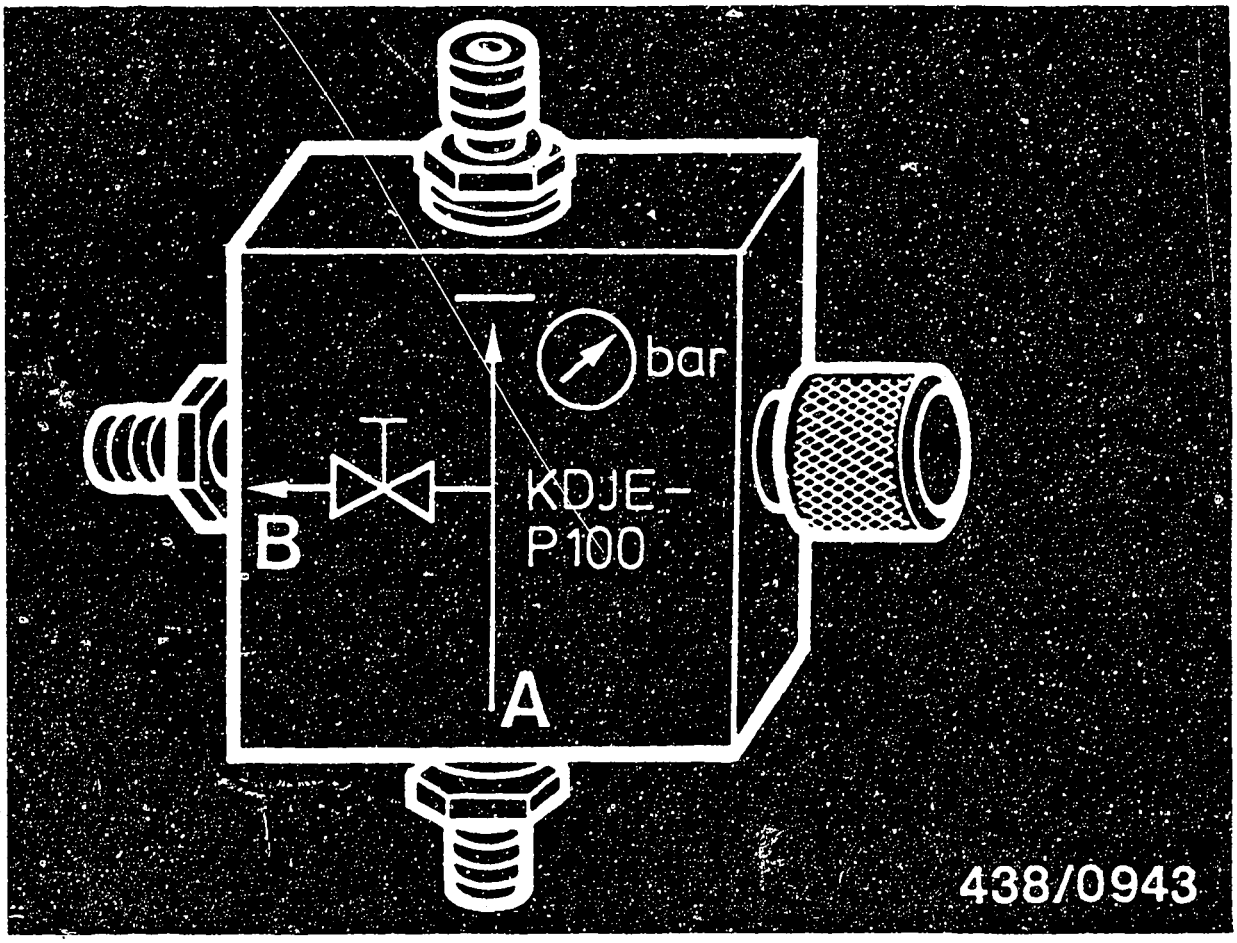
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

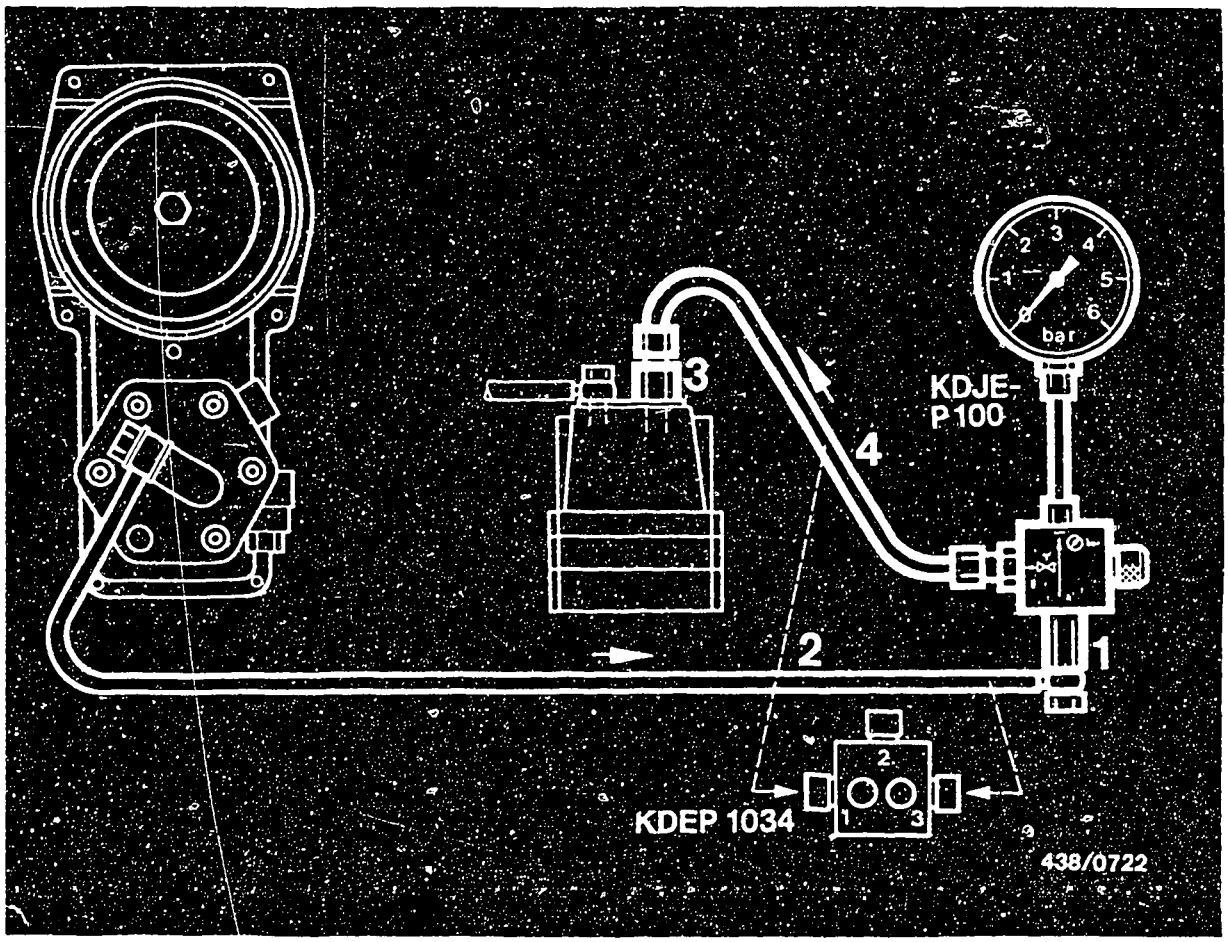


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

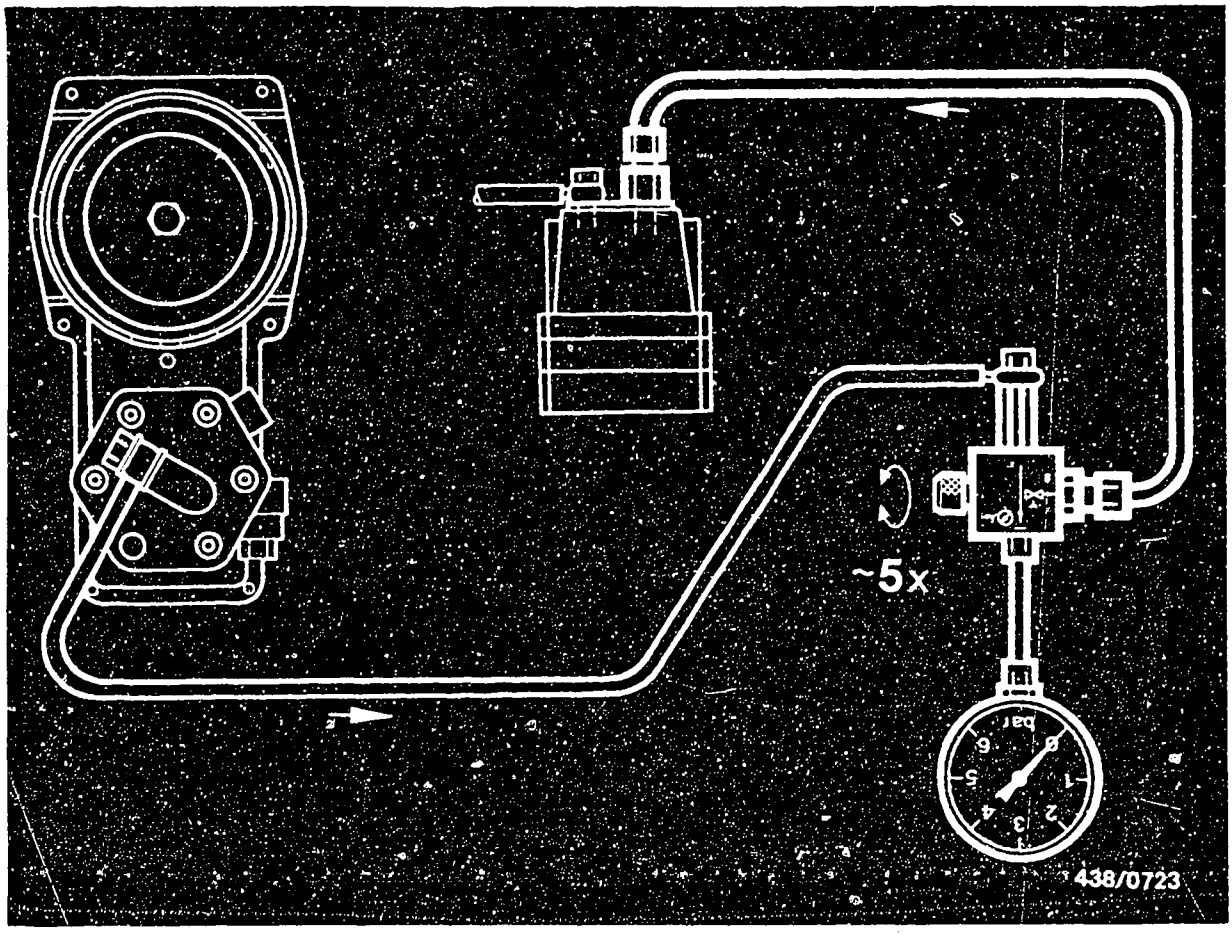
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
Fit using connecting-parts set KDJE-P 100/12.

- Screw the adapter (1) with seal onto inlet fitting A or 3 of the directional-control valve.
- Unscrew the control-pressure line (2) on the warm-up regulator and connect with inlet-union screw M 10 x 1 and seal rings to the adapter (1).
- Screw connecting piece (3) of connecting-parts set into inlet of warm-up regulator and, using hose line (4), connect to outlet fitting B or 1 of the directional-control valve.

Suspend the pressure gauge from the engine hood (possibly using a wire hook).



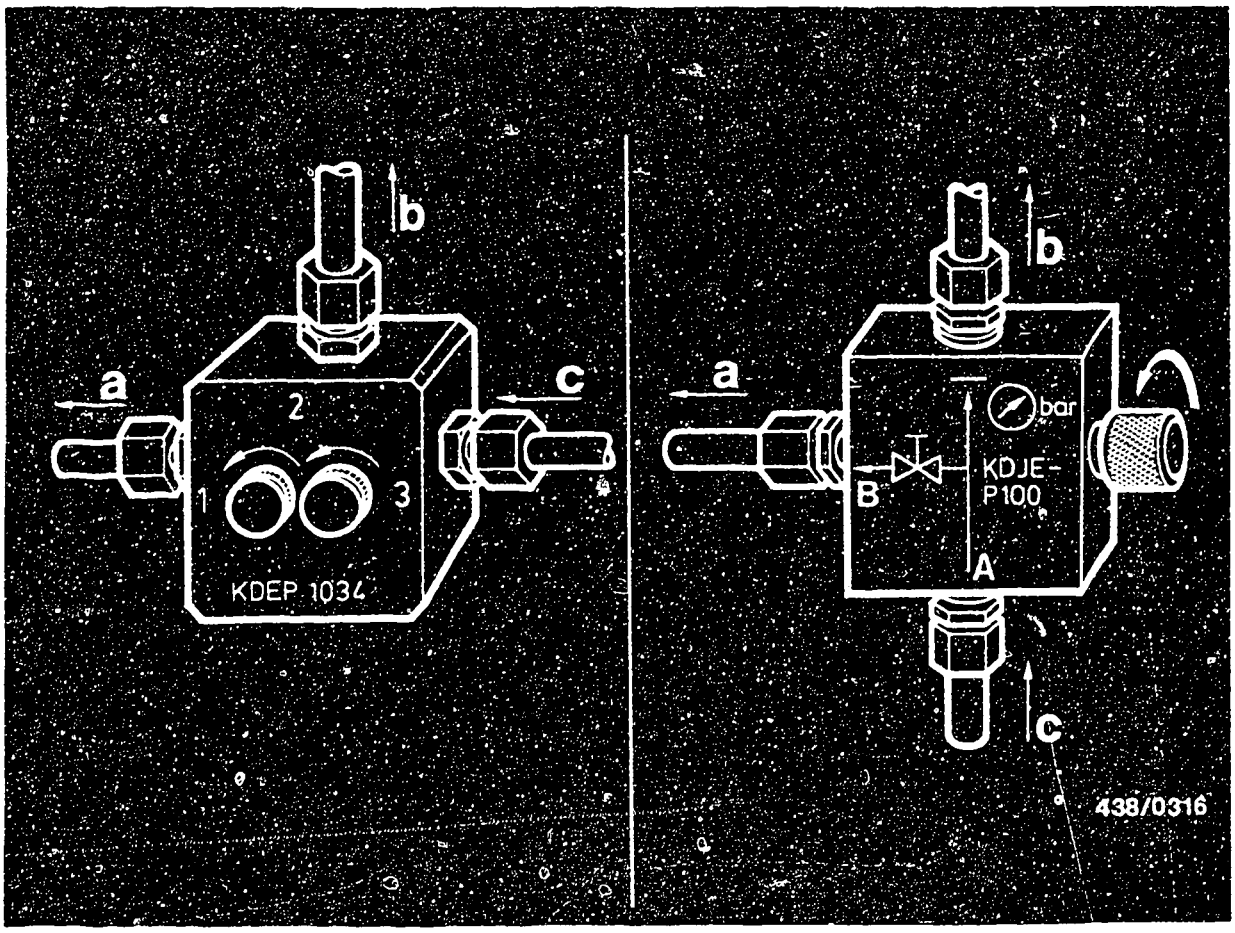
16.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off.

Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

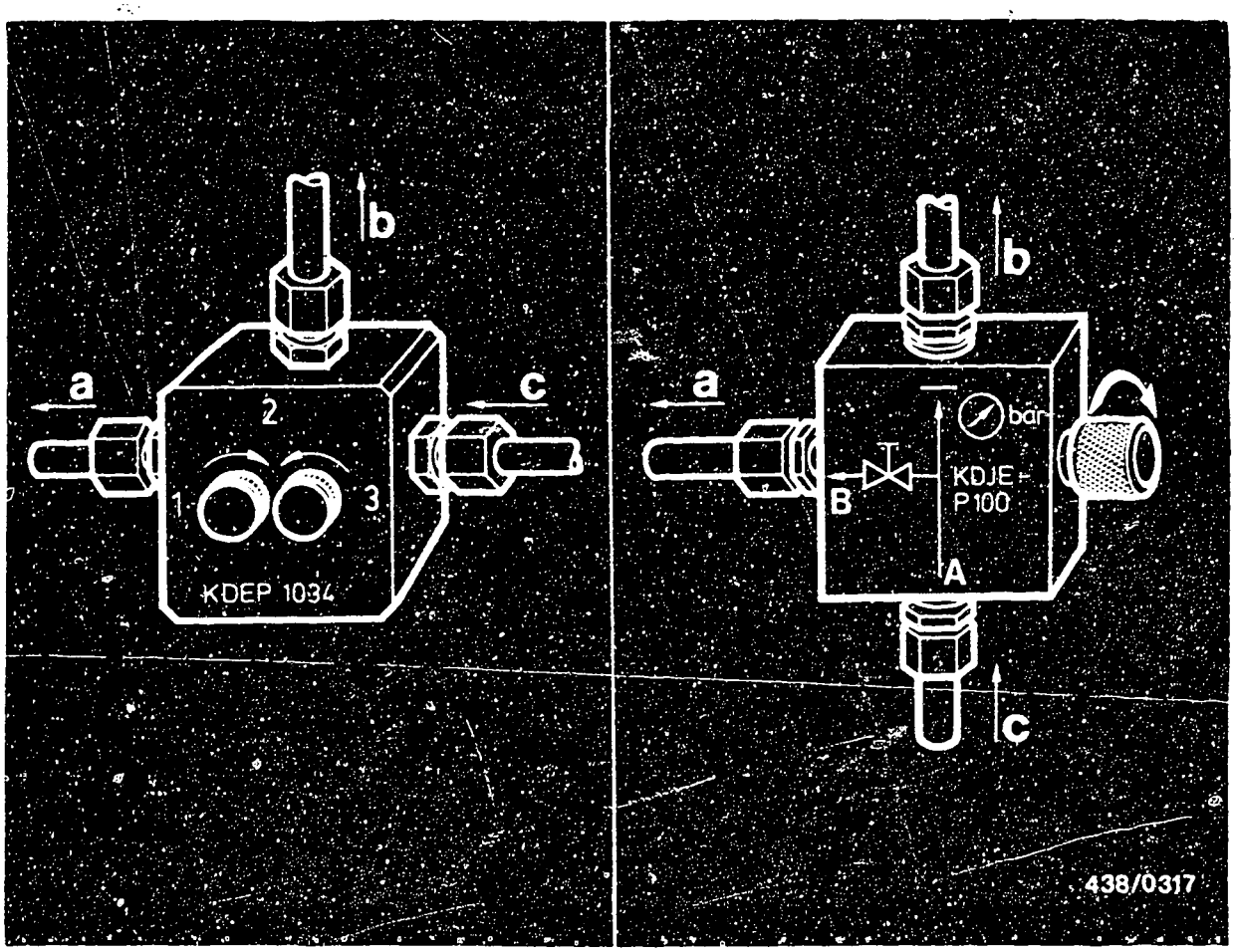
Test specifications for leak test:

With fuel accumulator
Part number:

0 438 170 027
0 438 170 028

Minimum pressure after:

10 minutes	2.5 bar	(2.6 kgf/cm³) gauge pressure
20 minutes	2.4 bar	(2.5 kgf/cm³) gauge pressure.

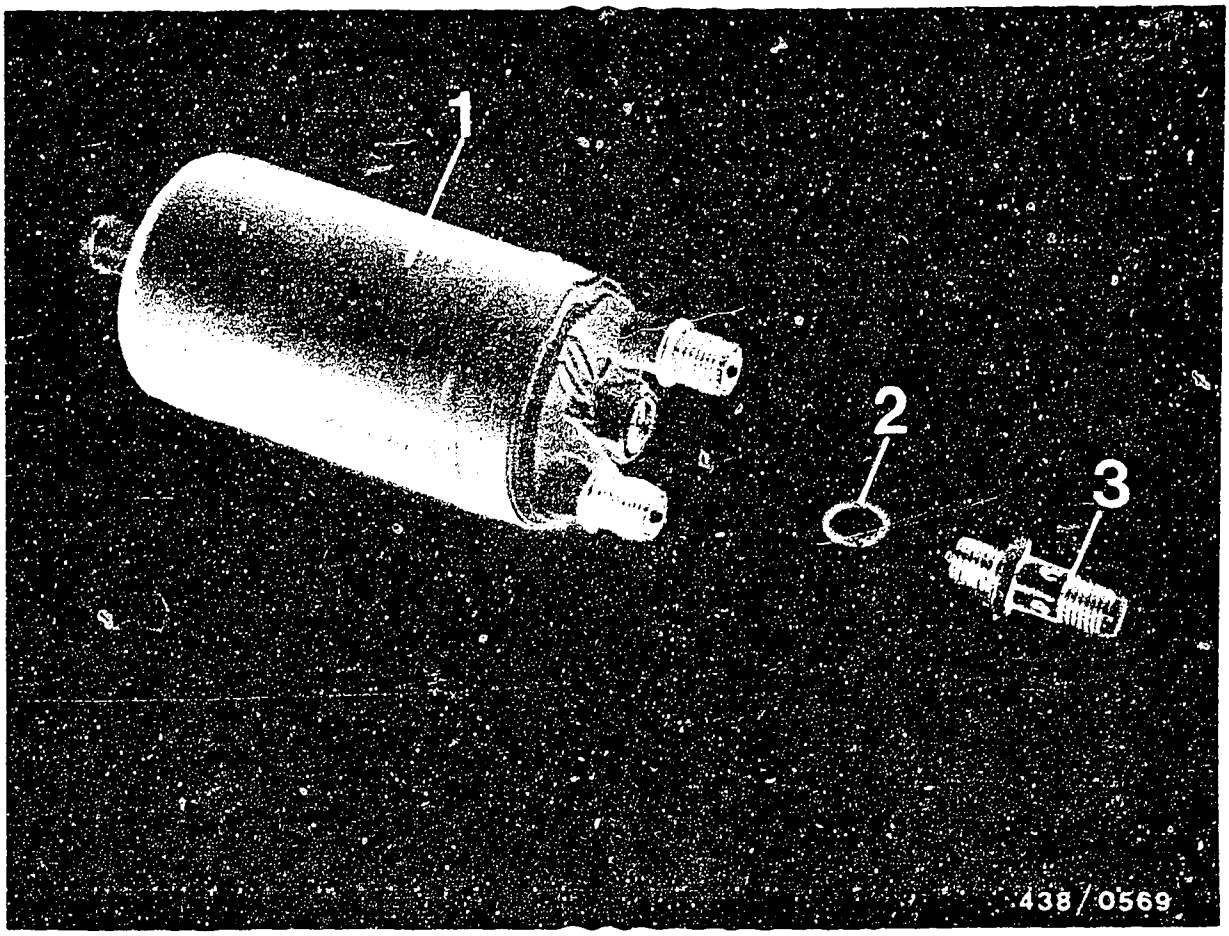


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



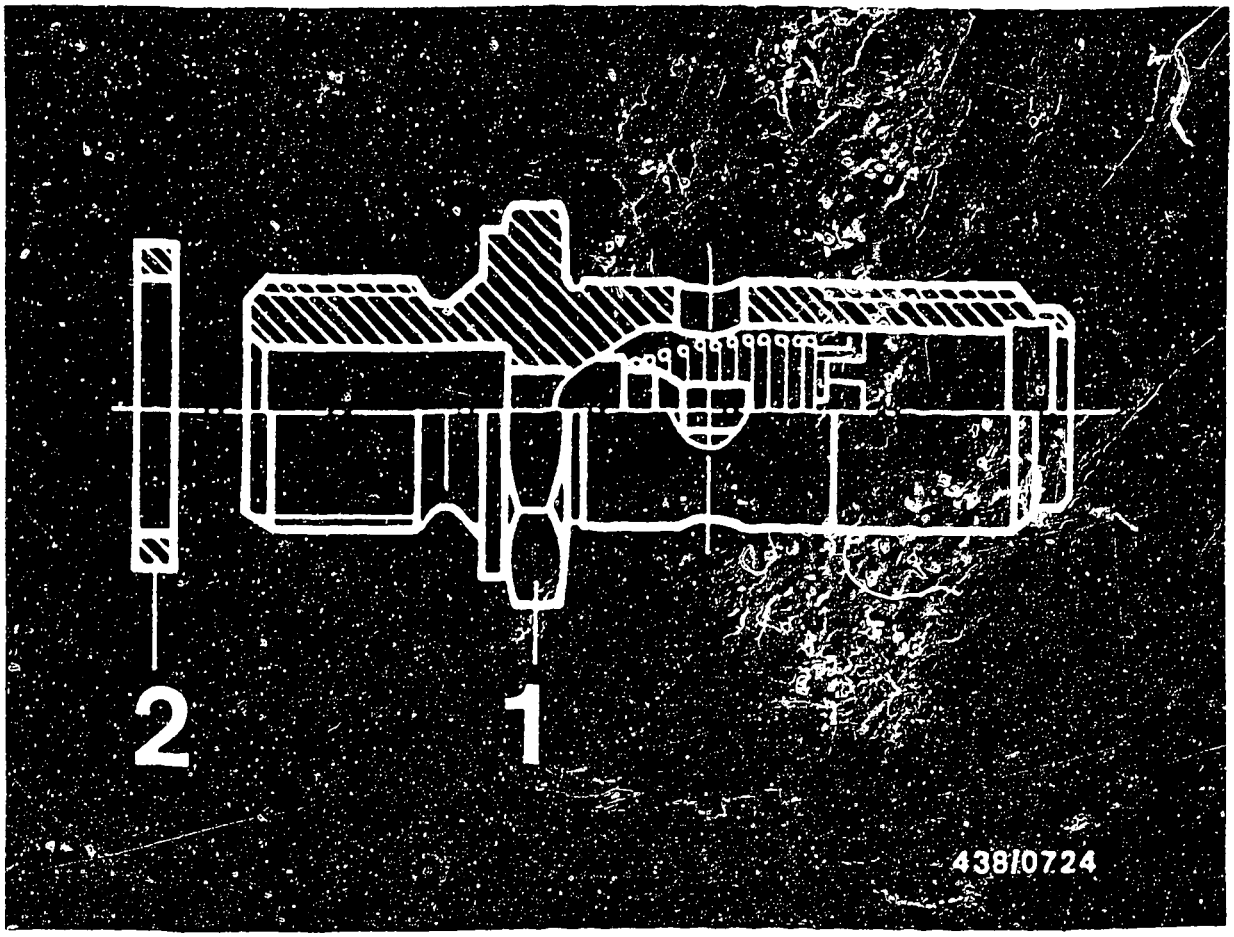
1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

16.4 Possible causes of trouble in primary-pressure circuit

- Non-return valve in tube fitting of electric fuel pump leaking

Part number of electric fuel pump: 0 580 254 959/960 (Installed in Audi Coupé GT / 5E).

The non-return valve is integrated in the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

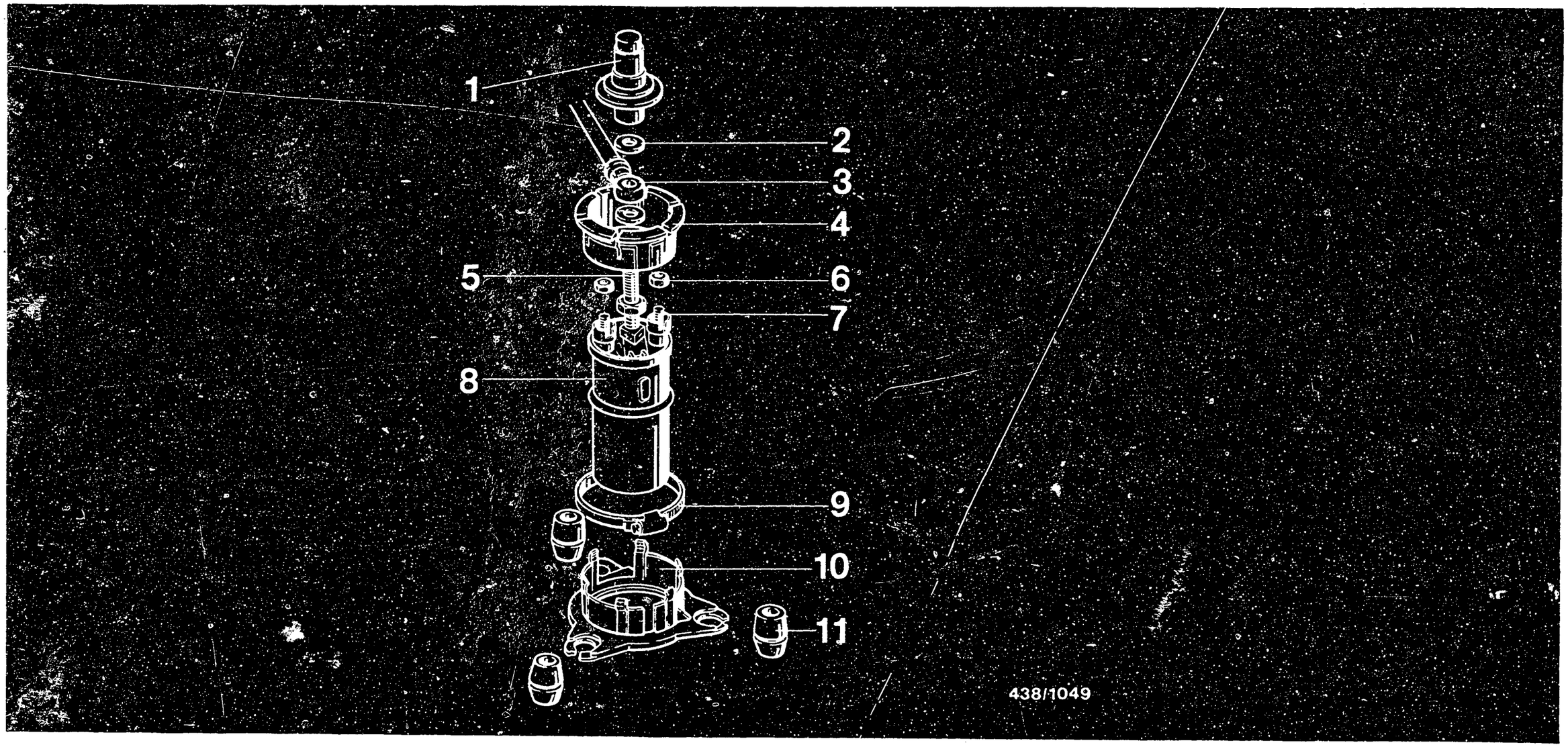
Parts set: 1 587 010 002

If necessary, replace the tube fitting from the parts set 1 587 010 002 as follows:

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Screw off the delivery line, collecting any escaping fuel.
Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

Check connections for leaks with the electric fuel pump in operation.

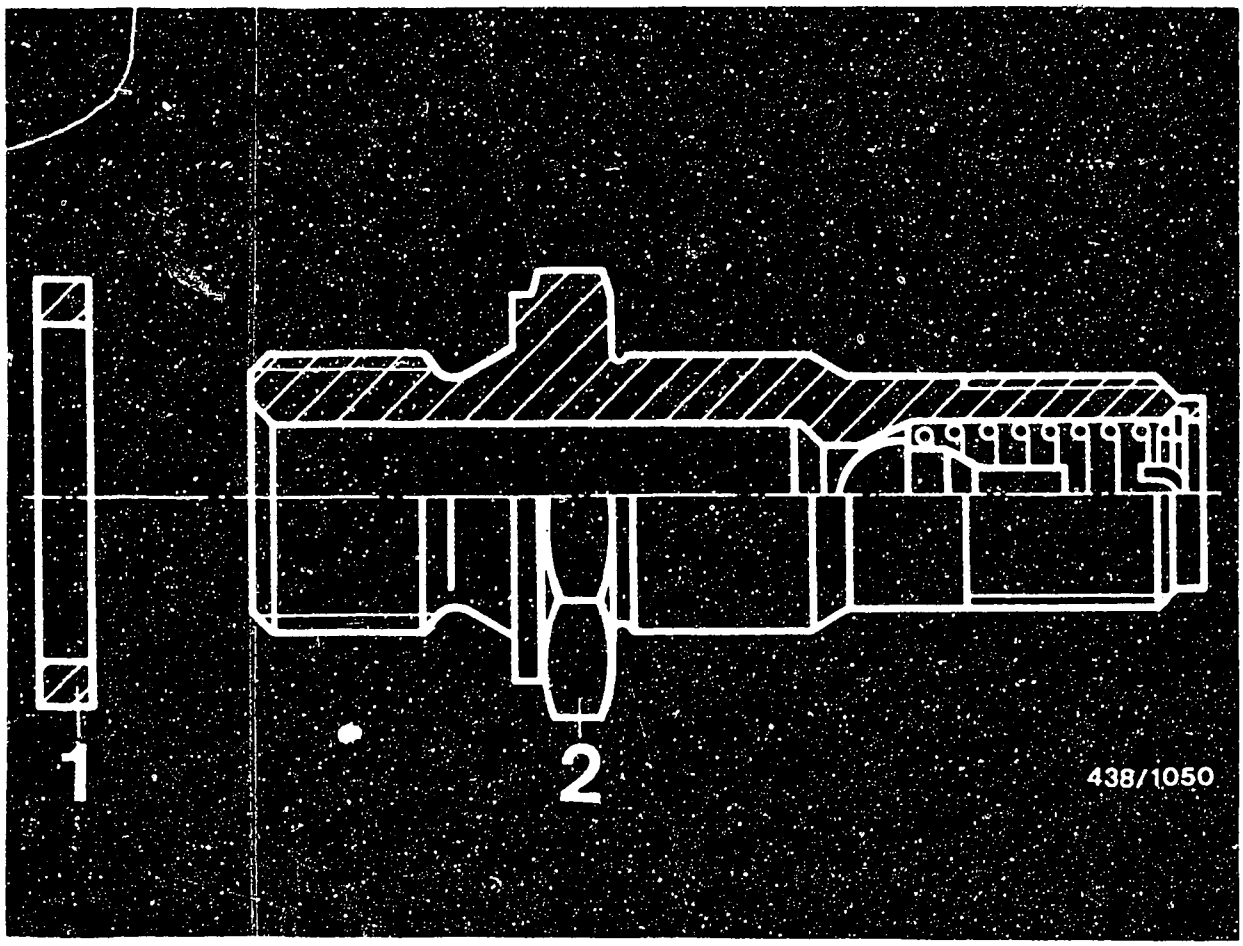


1 = Pressure damper
2 = Seal ring
3 = Flow line
4 = Clamping sleeve
5 = Non-return valve
6 = Hexagon nut
7 = Electrical connections
8 = Electric fuel pump
9 = Hose clamp
10 = Holder
11 = Rubber mounting

• Non-return valve in tube fitting of intank electric fuel pump leaking

Part number of electric fuel pump: 0 538 254 003 / 0 580 254 004 (installed in Audi 100/5E).

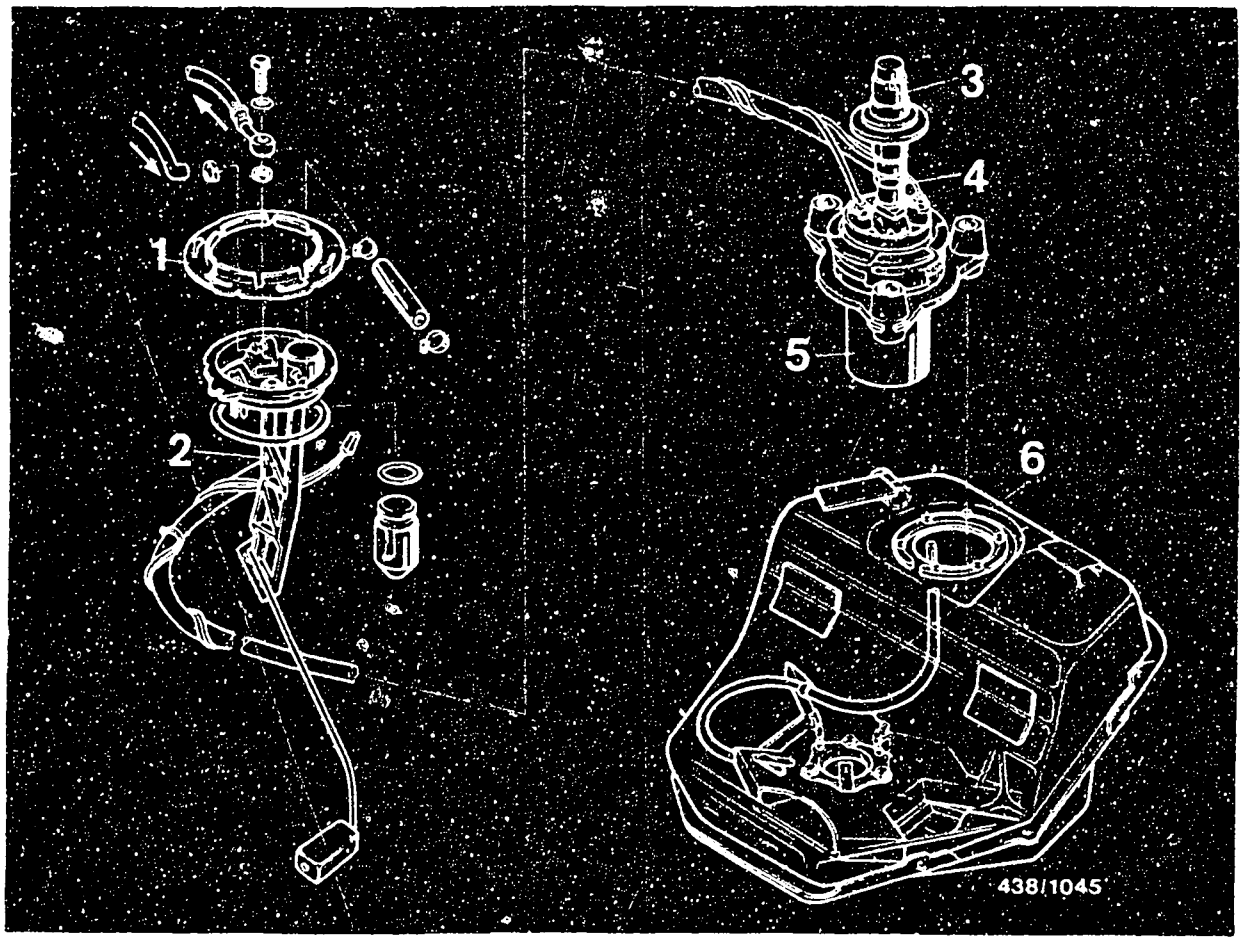
The non-return valve is integrated in the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 500

If necessary, replace the tube fitting from the parts set 1 587 010 500 as follows:



1 = Closure ring
2 = Fuel tank sender
3 = Pressure damper
4 = Non-return valve
5 = Electric fuel pump
6 = Fuel tank

Remove closure ring and take out fuel tank sender.

Withdraw complete unit (electric fuel pump, non-return valve and pressure damper) from ratchet springs on base of fuel tank.

Unscrew pressure damper and remove flow line with flat seal rings.

Unscrew tube fitting with defective non-return valve.

Screw new tube fitting (short end) with thick flat seal ring into the delivery fitting and tighten to a torque of 17 ... 25 Nm.

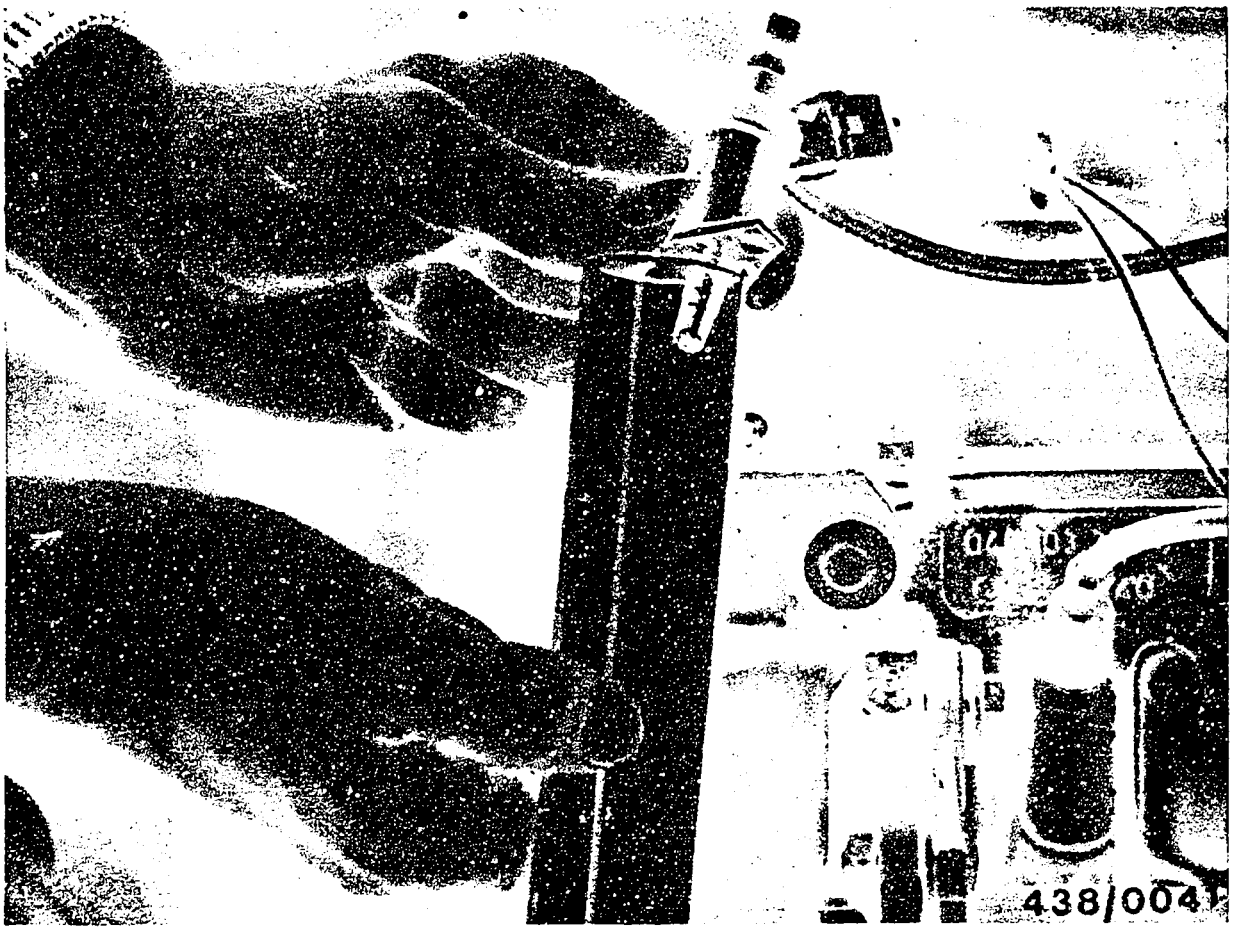
Hold the hexagonal section of the delivery fitting with a wrench.

Fit thin flat seal ring, inlet union of fuel line and other flat seal ring onto the long side of the tube fitting and tighten by means of pressure damper.

Tightening torque 17 ... 25 Nm.

Re-install complete unit, making sure that the electric fuel pump is correctly positioned.

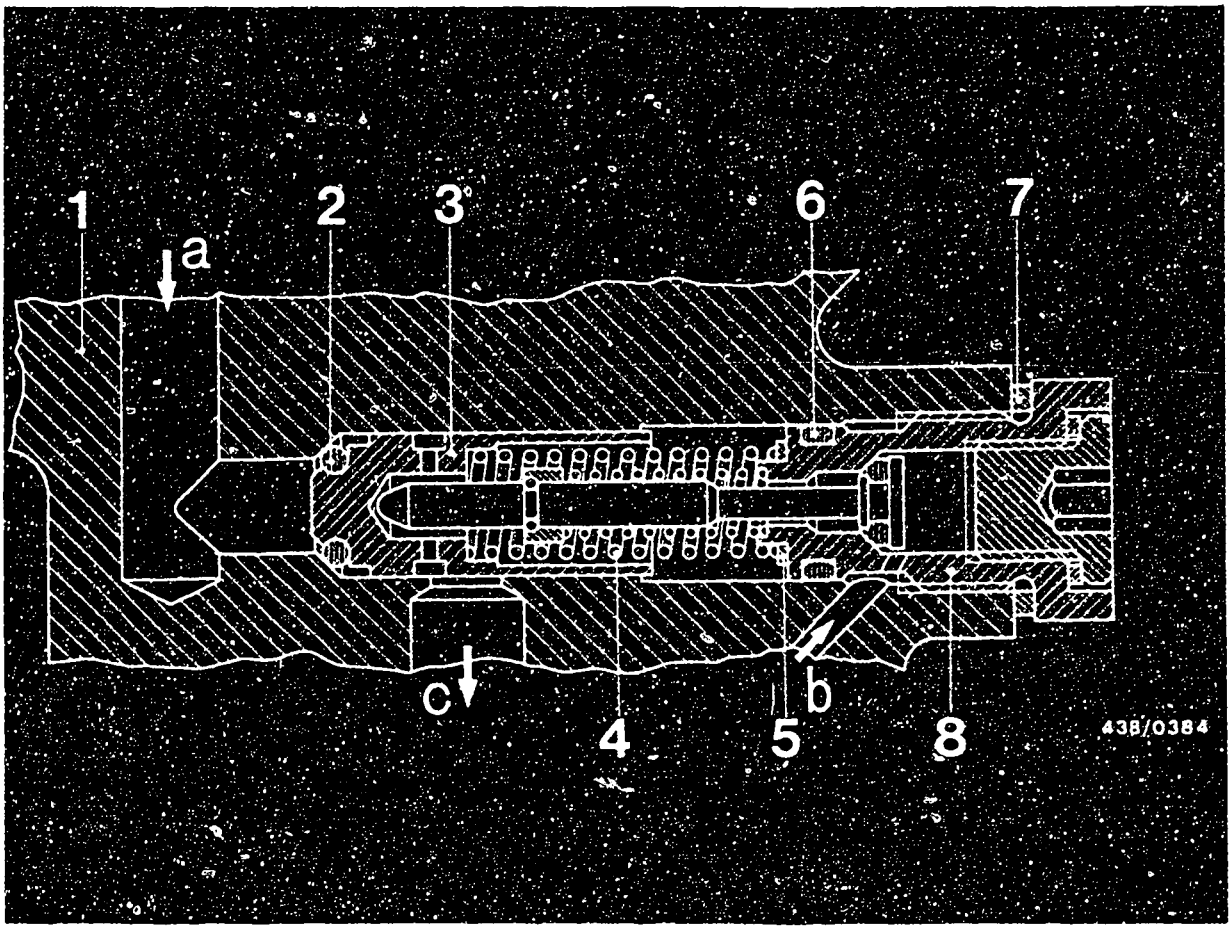
Danger of kinking fuel lines.



- The cold-start valve has a leak

Remove cold-start valve. Hose line remains connected.

Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature. See Coordinates F 13.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- Seal ring (O-ring) in the primary-pressure regulator has a leak.

  Replace the seal ring.
  Clean the fuel distributor in the region of the primar-ypressure regulator.

Unscrew the large screw plug (8) with the complete push-up valve. Also remove the shims (5), control spring (4) and control plunger (3).

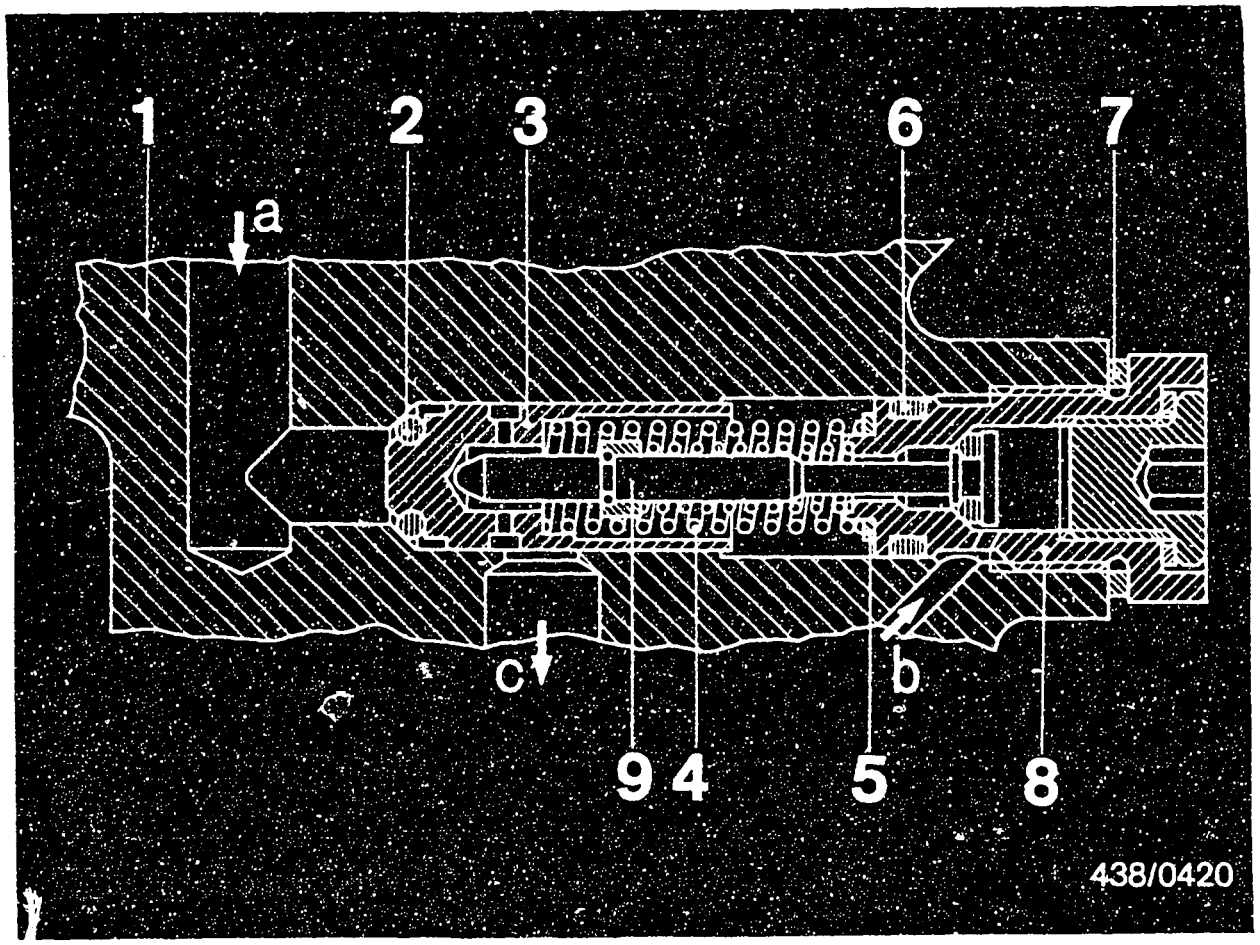
Replace the seal ring (O-ring) (2) on the control plunger. Install the control plunger and the control spring.

Screw in the screw plug with the complete push-up valve and with shims (as found when removing) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Checking values and setting values (gauge pressure) for primary pressure

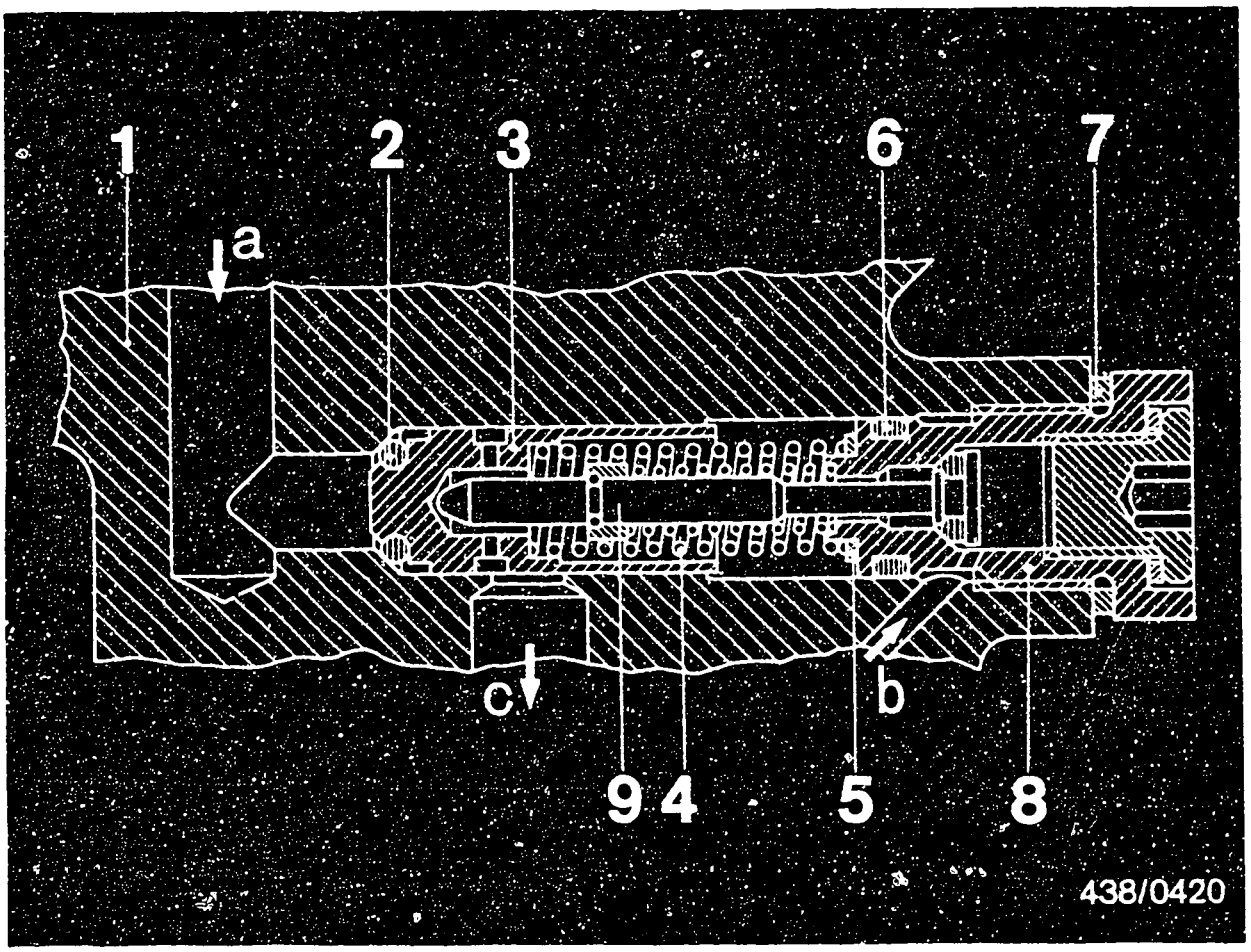
Fuel distributor Part no.	Checking value:	Setting value:
0 438 100 125 0 438 100 126	4.7...5.4 bar (4.8...5.5 kgf/cm²)	4.9...5.1 bar (5.0...5.2 kgf/cm²)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

16.5 Possible causes of a defect in the control-pressure circuit

The push valve (9) in the primary-pressure regulator has a leak.
Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the whole push valve (ready-assembled unit) must be changed.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug together with the complete push valve. Pay attention to control spring and shims.
Screw in new push valve using the number of shims (5) as when removed, new O-ring (6) and flat seal ring.
Finally, check the primary pressure and, if necessary, adjust by changing the shims.

Checking values and setting values (gauge pressure) for primary pressure

Fuel distributor	Checking value:	Setting value:
0 438 100 125 0 438 100 126	4.7 ... 5.4 bar (4.8...5.5 kgf/cm²)	4.9 ... 5.1 bar (5.0...5.2 kgf/cm²)

17. Testing the injection valves.

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.

When re-installing the injection valves, replace the O-rings on the valve stem if possible, part no. 3 430 210 600, to prevent leaks and entry of unmetered air.
In addition, the insulating sleeves should be tested for leaks. If necessary, tighten using Allen wrench (AF = 11 mm).

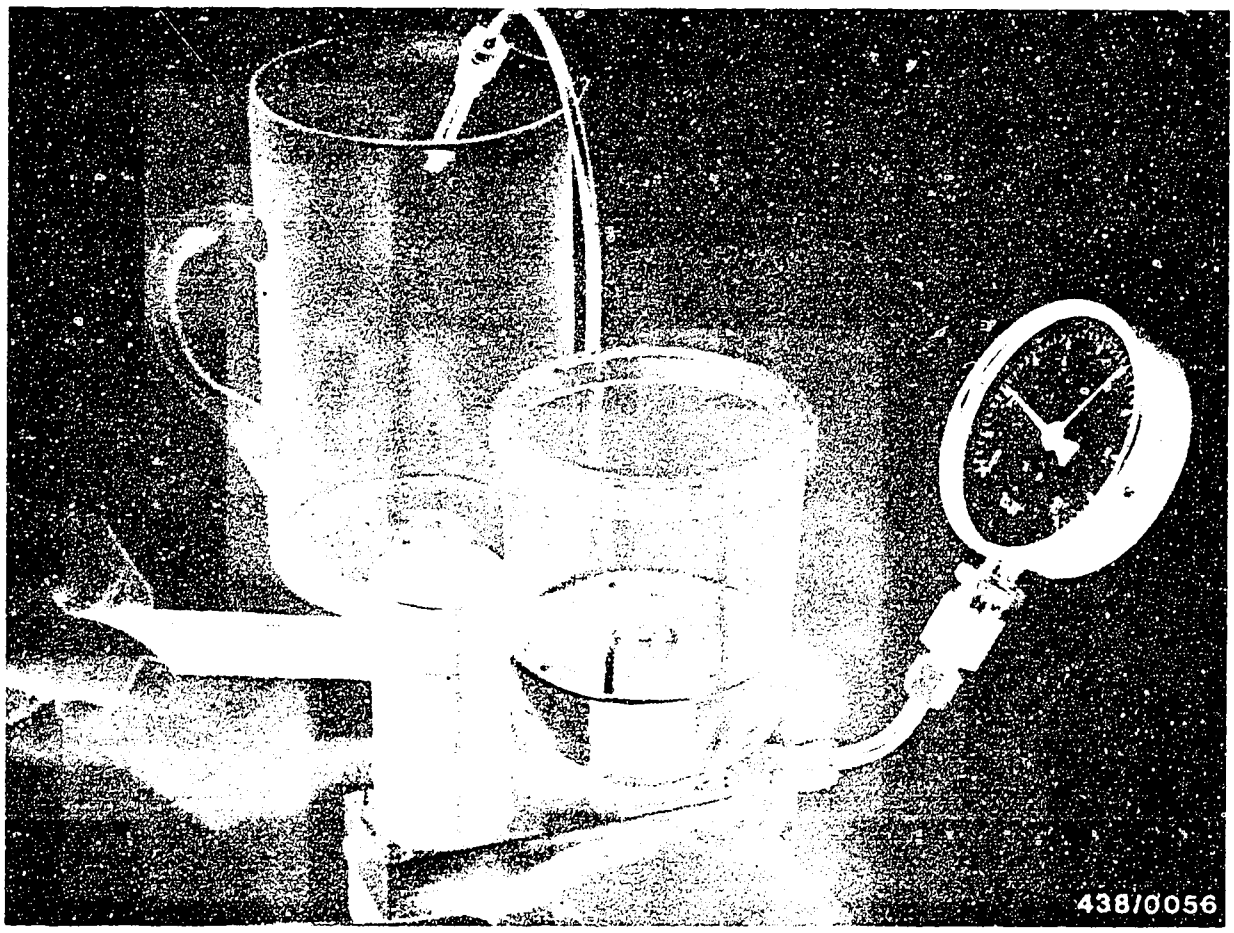
17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.



17.2 Connecting the injection valve to the tester

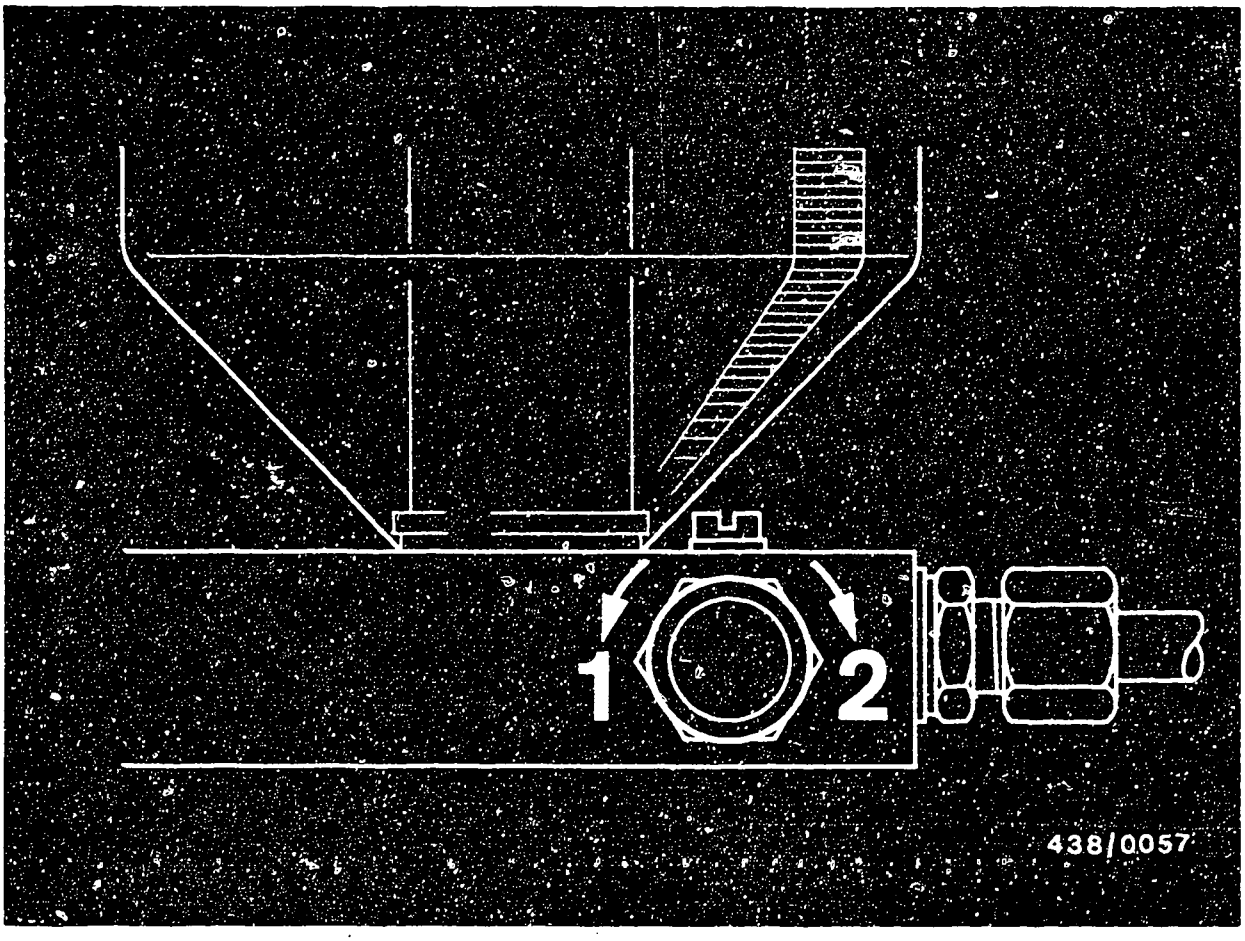
Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. The tighten the union nut.

17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

You can try to flush the injection valve clear by moving the lever back and forth several times strongly.

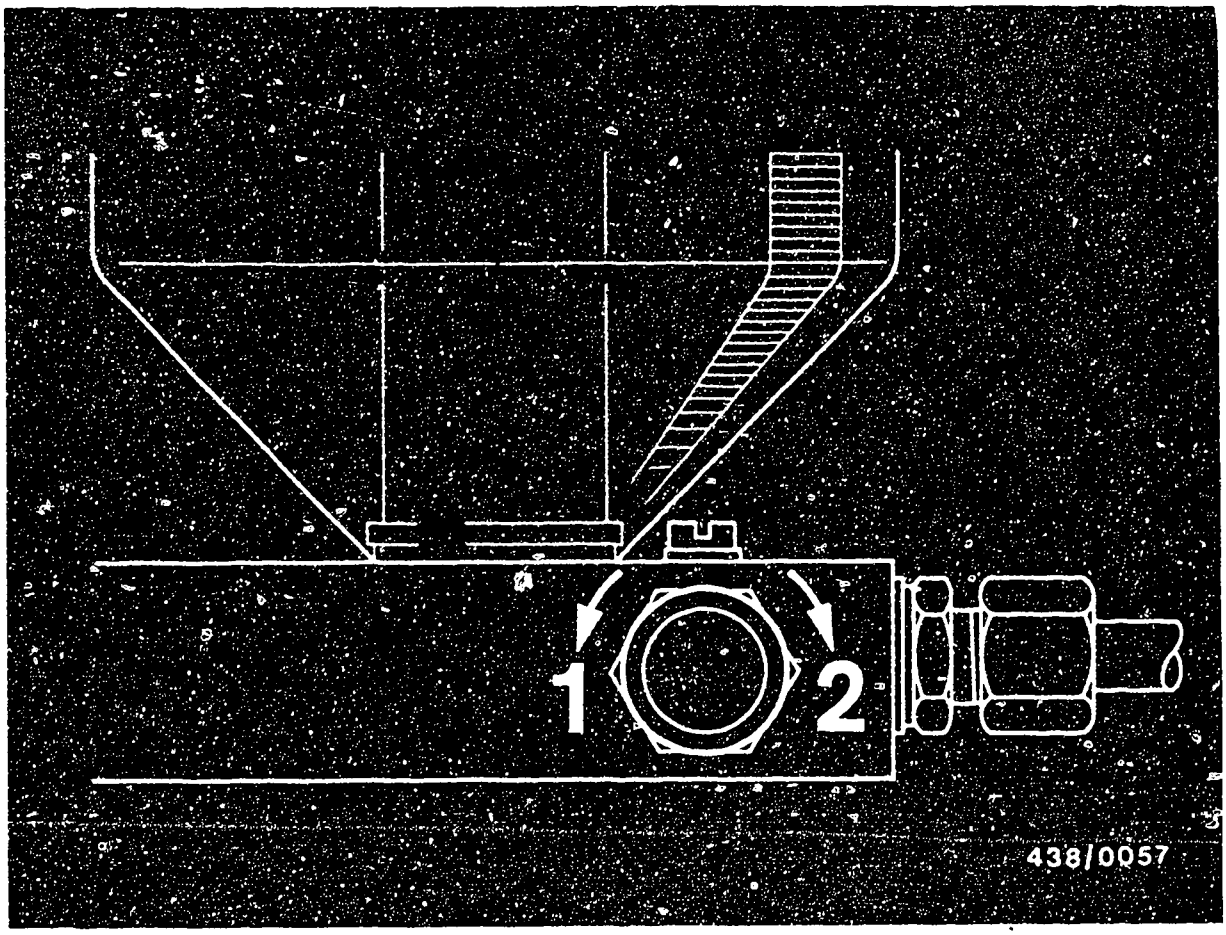
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Closed

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (Gauge pressure)
0 437 502 023 0 437 502 024	3.0...4.1 bar (3.1...4.2 kgf/cm²)



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).
If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.

438/0058

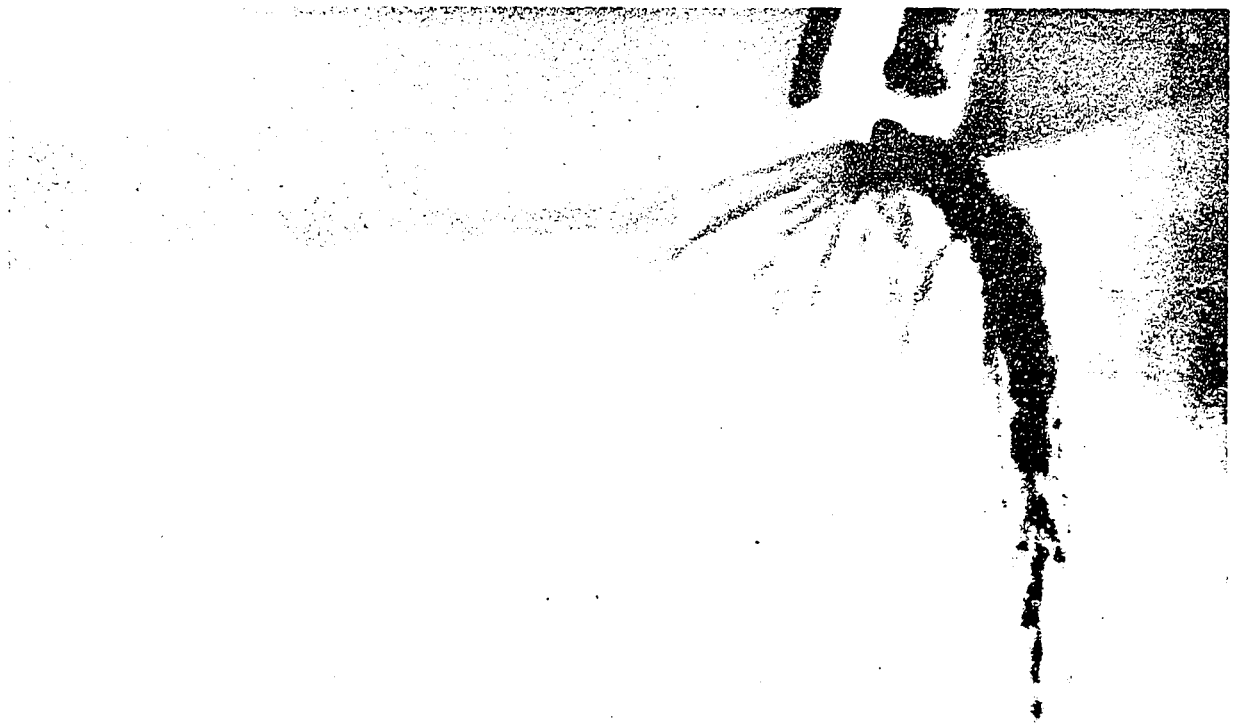
17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35^{o} is permissible (see example given in illustrations).

Illustration shows good spray formation.

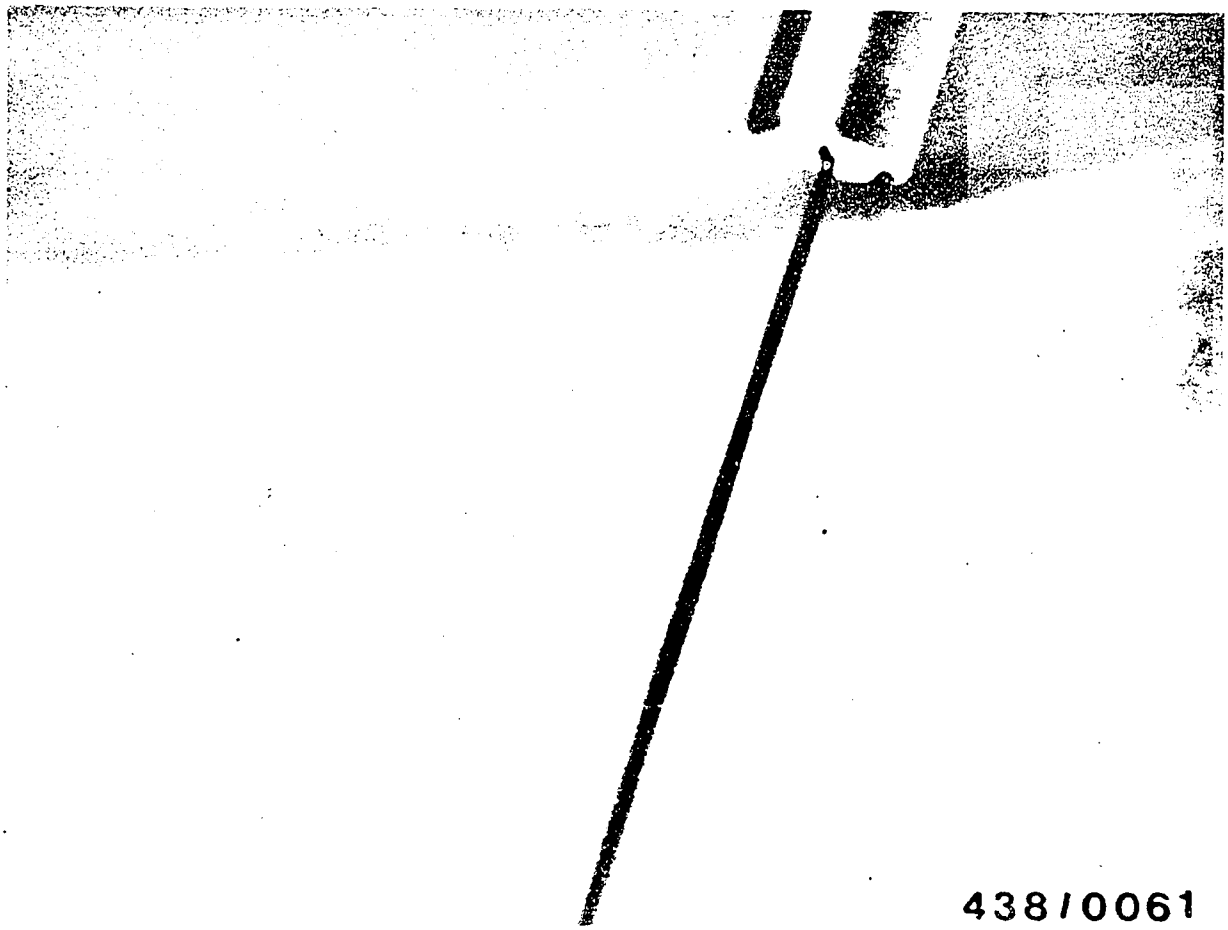
43810059

Illustration shows single-sided but nevertheless good spray formation.



438/0060

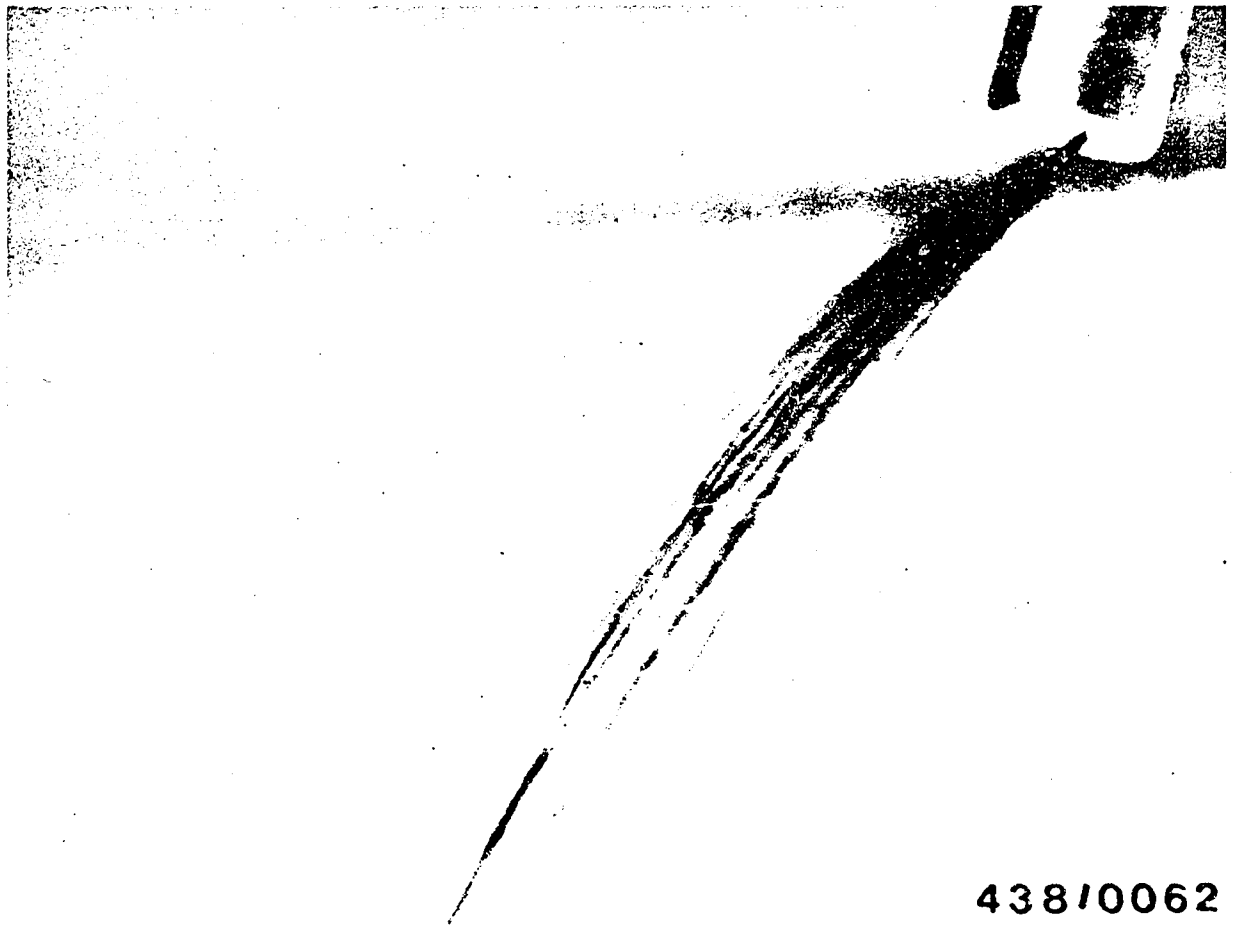
Poor spray formation; replace injection valves.
Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



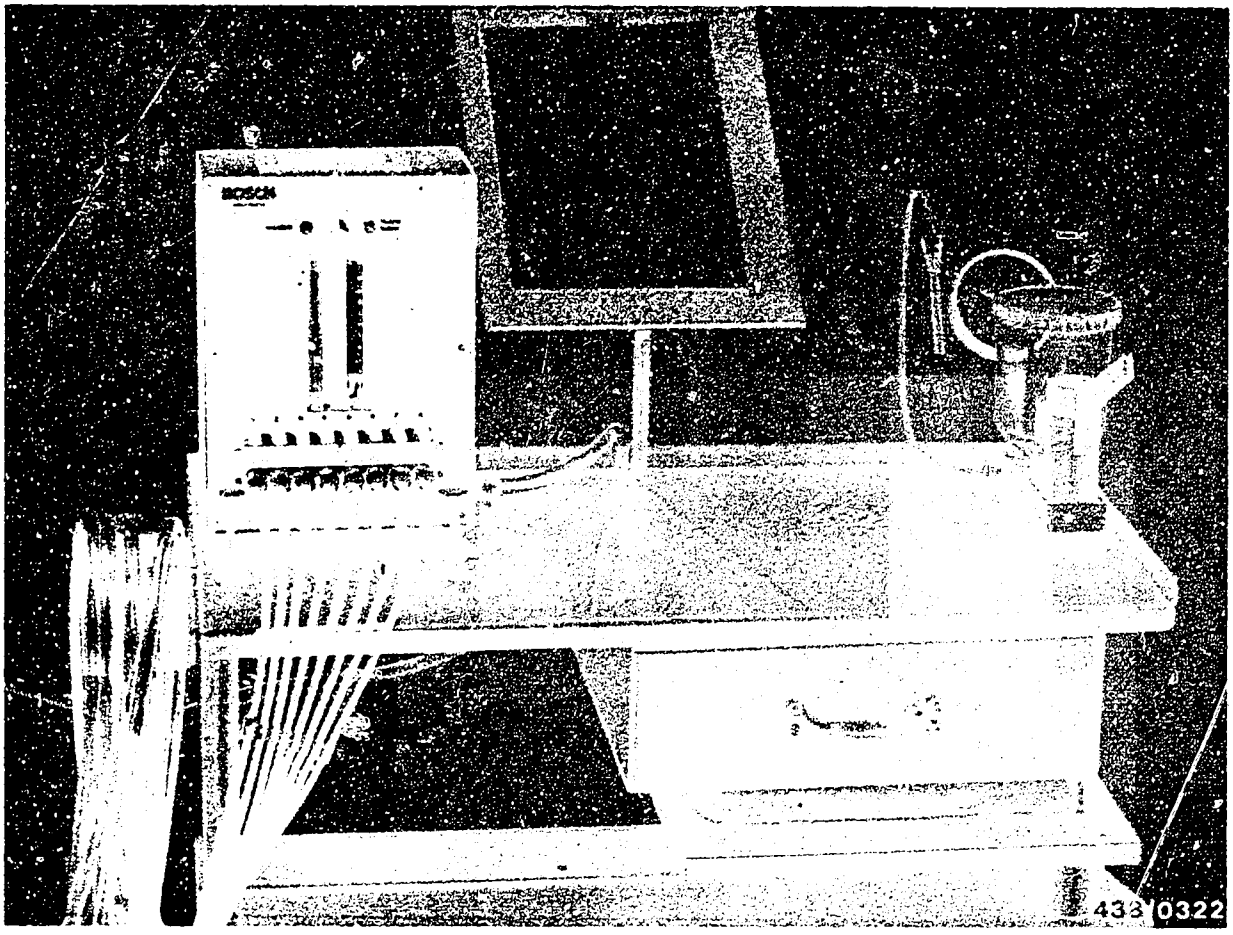
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F13.



18. Comparative measurement of fuel delivery of fuel distributor outlets.

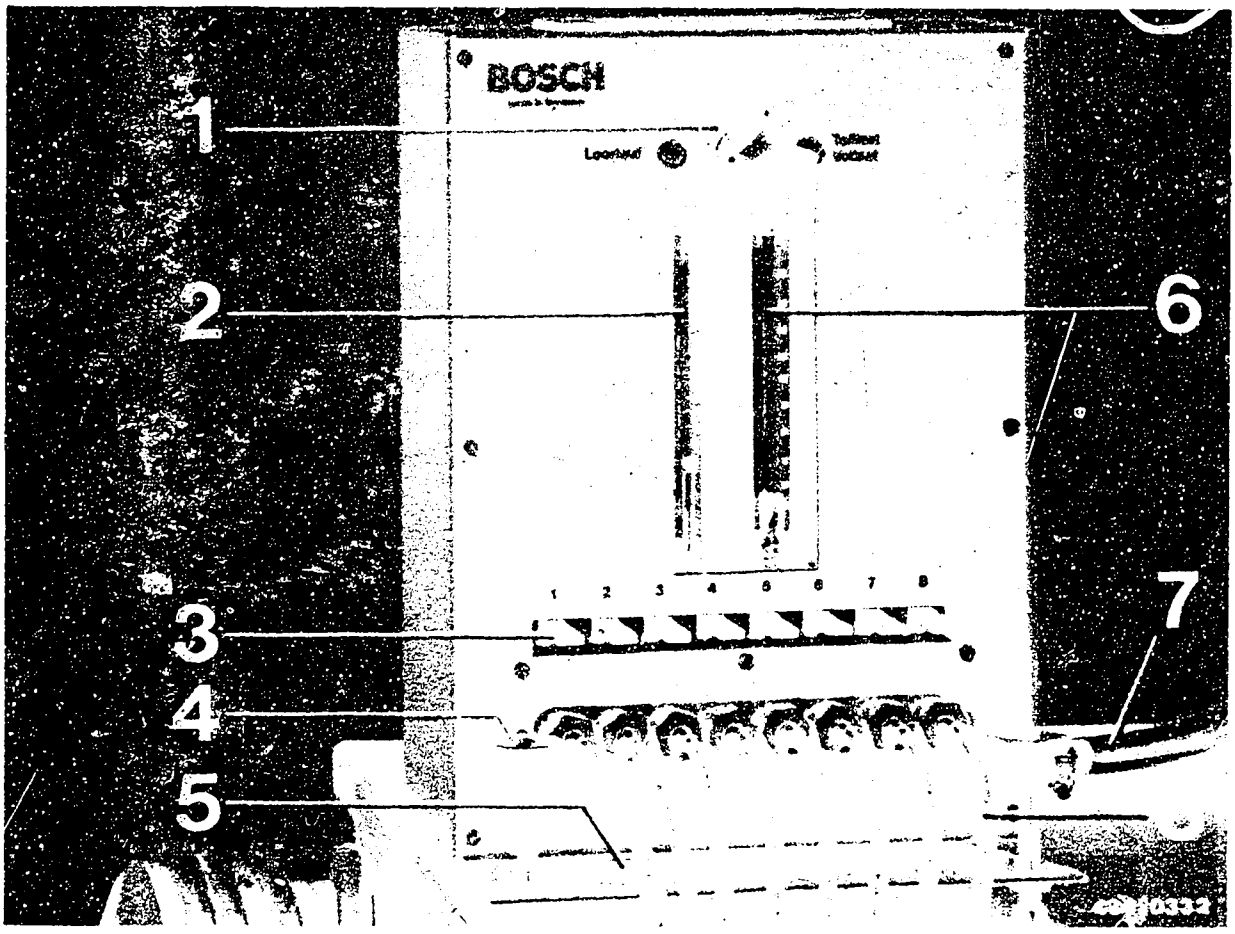
This test is carried out using the tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.

The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.

Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

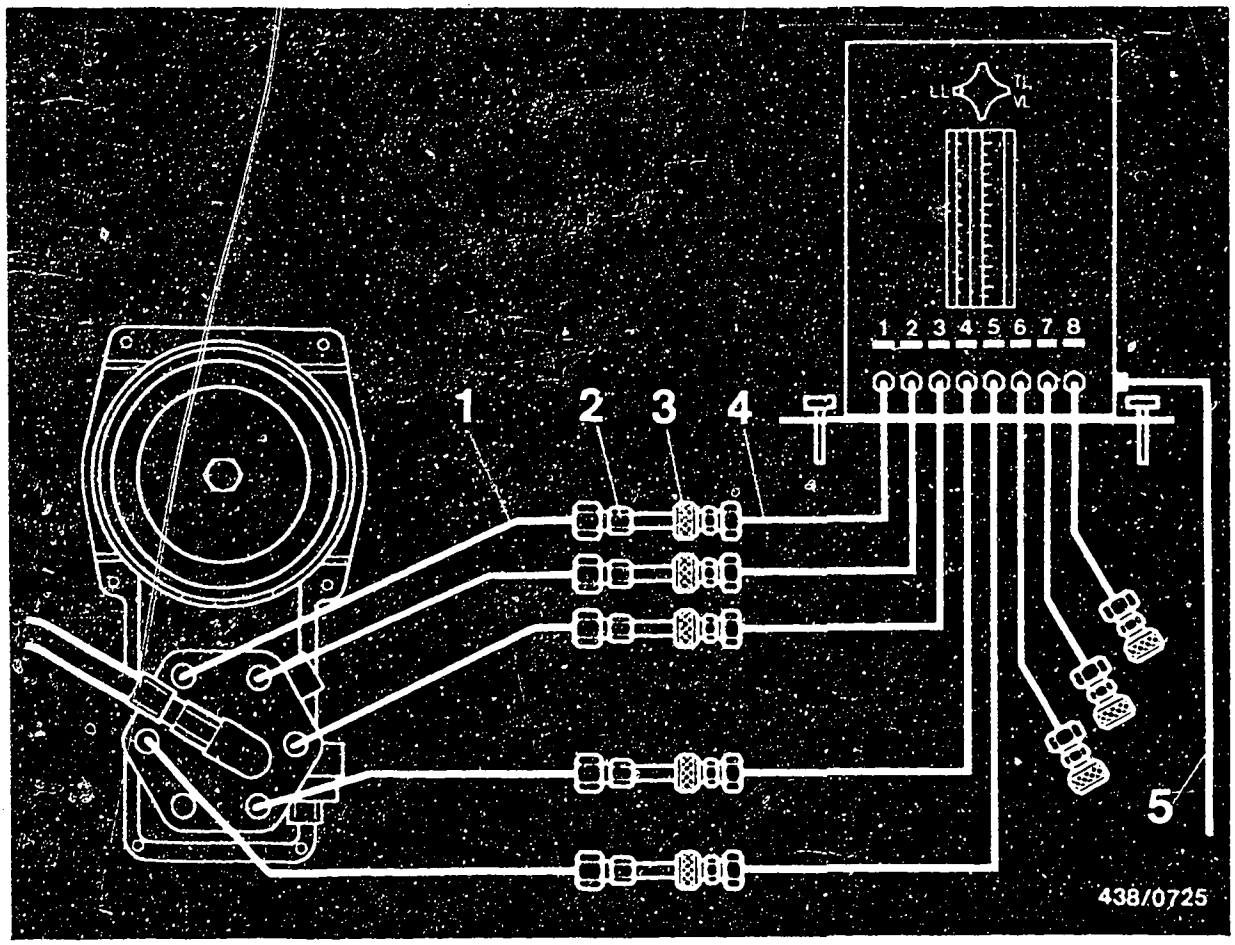
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 - Fuel-injection tubing of fuel distributor
2 - Injection valves
3 - Automatic connectors
4 - Tester hoses
5 - Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the vehicle on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level (water level at base of the tester).

Remove injection valves; the injection tubing remains connected.
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

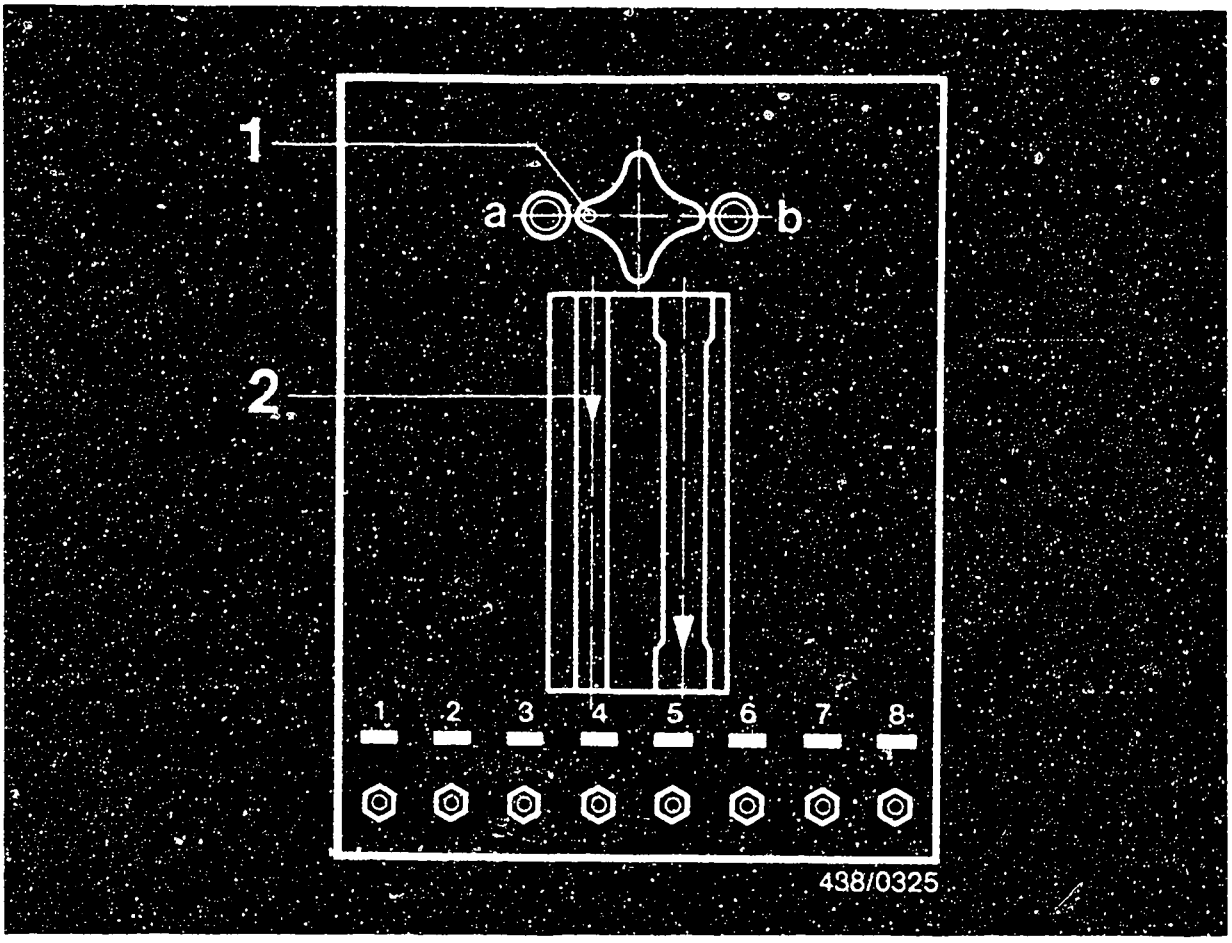
Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the air filter so that air-flow sensor plate becomes accessible.

Remove electrical plug from warm-up regulator.

Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.



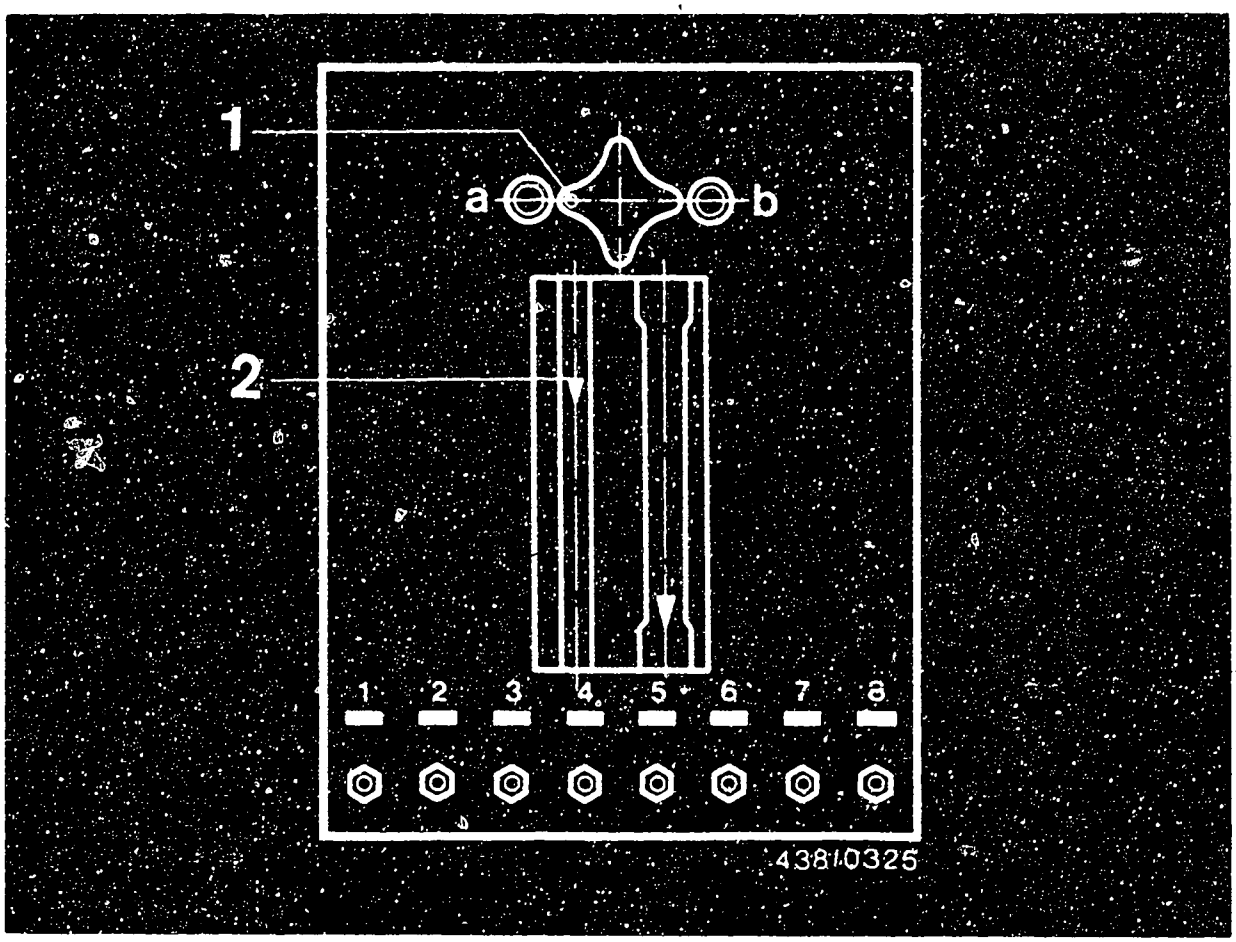
a = Idle
b = Part load/full load

1 = White dot
2 = Measuring line

18.5 Testing:

The flow comparison measurement is made in the idle, part-load and full-load ranges.

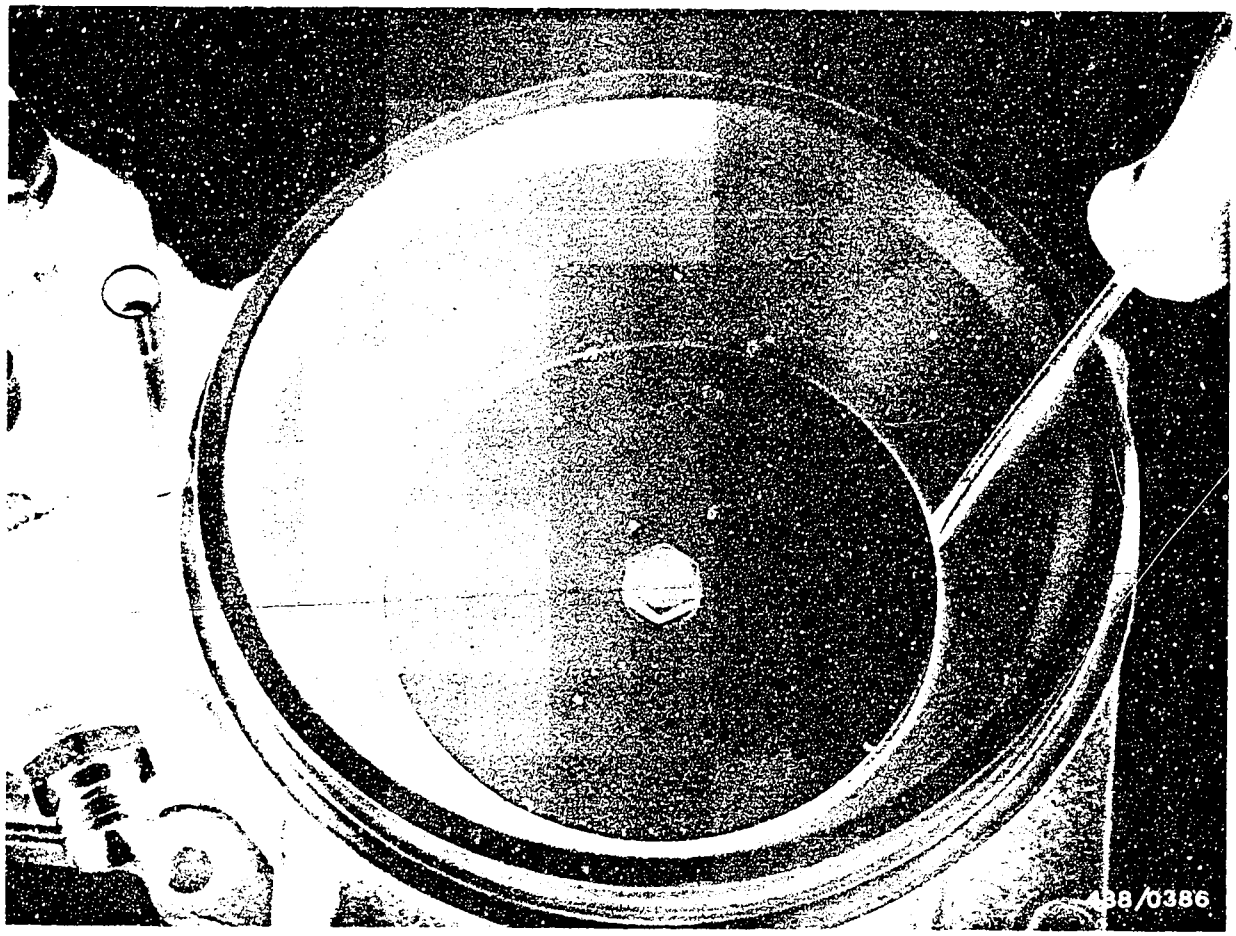
The small rotameter tube is to be used for the idle measurement (white dot to left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

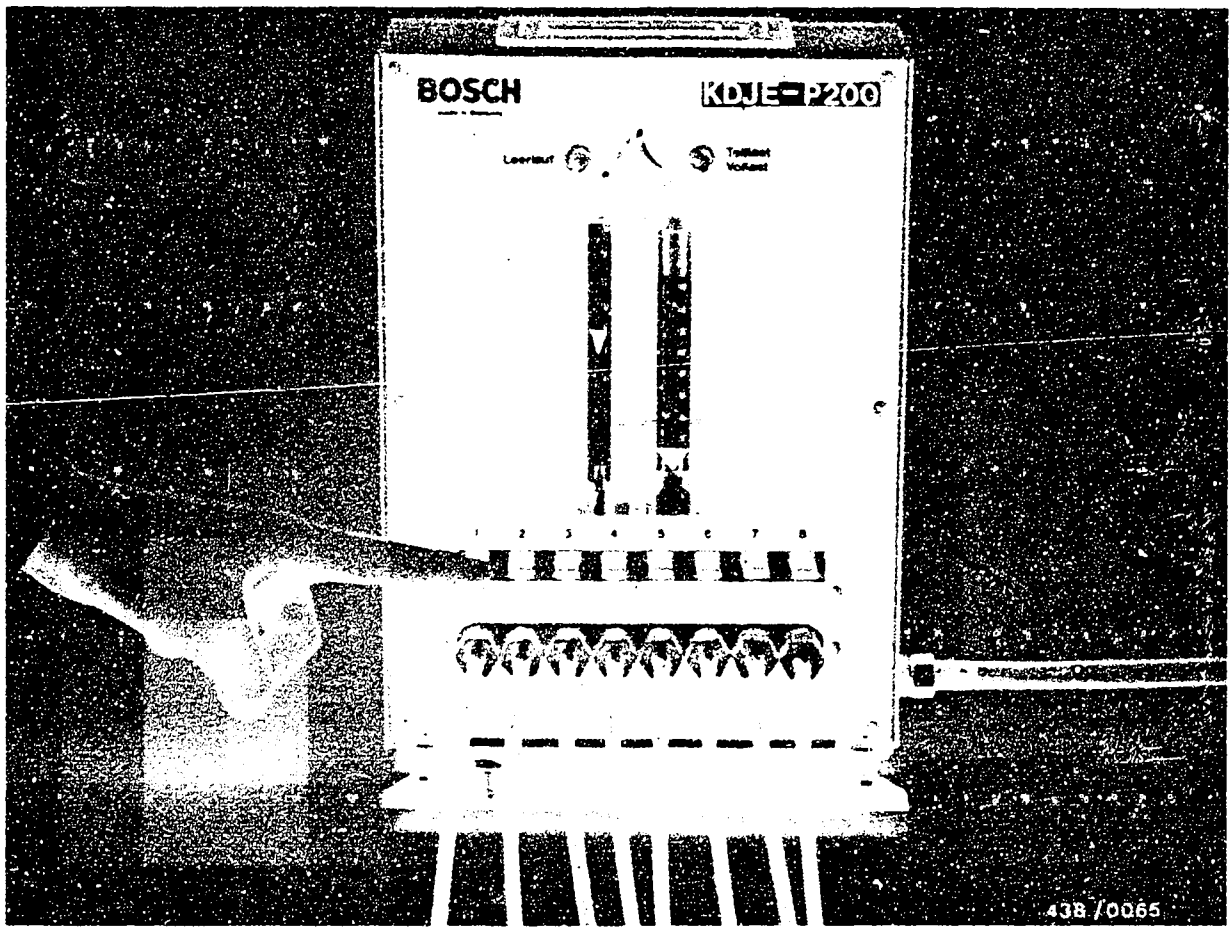
The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.
The "set-point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set-point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set-point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set-point".

18.6 Test specifications

Fuel distributor 0 438 100 125 0 438 100 126	Setting point (cm^3/min)	Max. allowable delivery (cm^3/min)
Idle	6.0	6.6
Part load	40.0	43.0
Full load	118.0	130.0

If, in testing, too large a difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.
If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.
Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Check seal rings on stem of injection valves for damage and deformation; if necessary, use new seal rings, part no. 3 430 210 600.

Also check the insulating sleeves. If necessary, tighten with hexagon-socket-screw key (AF 12 mm).

Re-install the injection valves. Make sure this is done correctly. Also install the rubber dome. Make sure that all lines are laid correctly.
Re-connect the electrical safety circuit of the K-Jetronic (re-insert relay). Make sure this is done correctly. By means of a trial run check whether all line connections are leak-tight.

Finally, check the idle adjustment. Correct if necessary (Coordinates F13).

19. Idle adjustment

19.1 Test conditions, general for all models:

- Warm the engine up for the idle adjustment (oil temperature approx. 80°C).
- If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.
- Engine-speed measurement with separate tachometer.

Further requirements prior to the idle and CO adjustment:

- Check whether the throttle lever is up against the idle stop. The cable must be adjusted free of tension.
- The engines are equipped as standard with overrun cut-off. This system must be rendered inoperative prior to the idle CO adjustment.
- Vehicles of the Australia, Canada, Sweden and Switzerland version are equipped with exhaust-gas recirculation (to reduce the emissions). This emission-control system must also be switched off for the idle adjustment.

  The following coordinates describe how to render both systems inoperative.

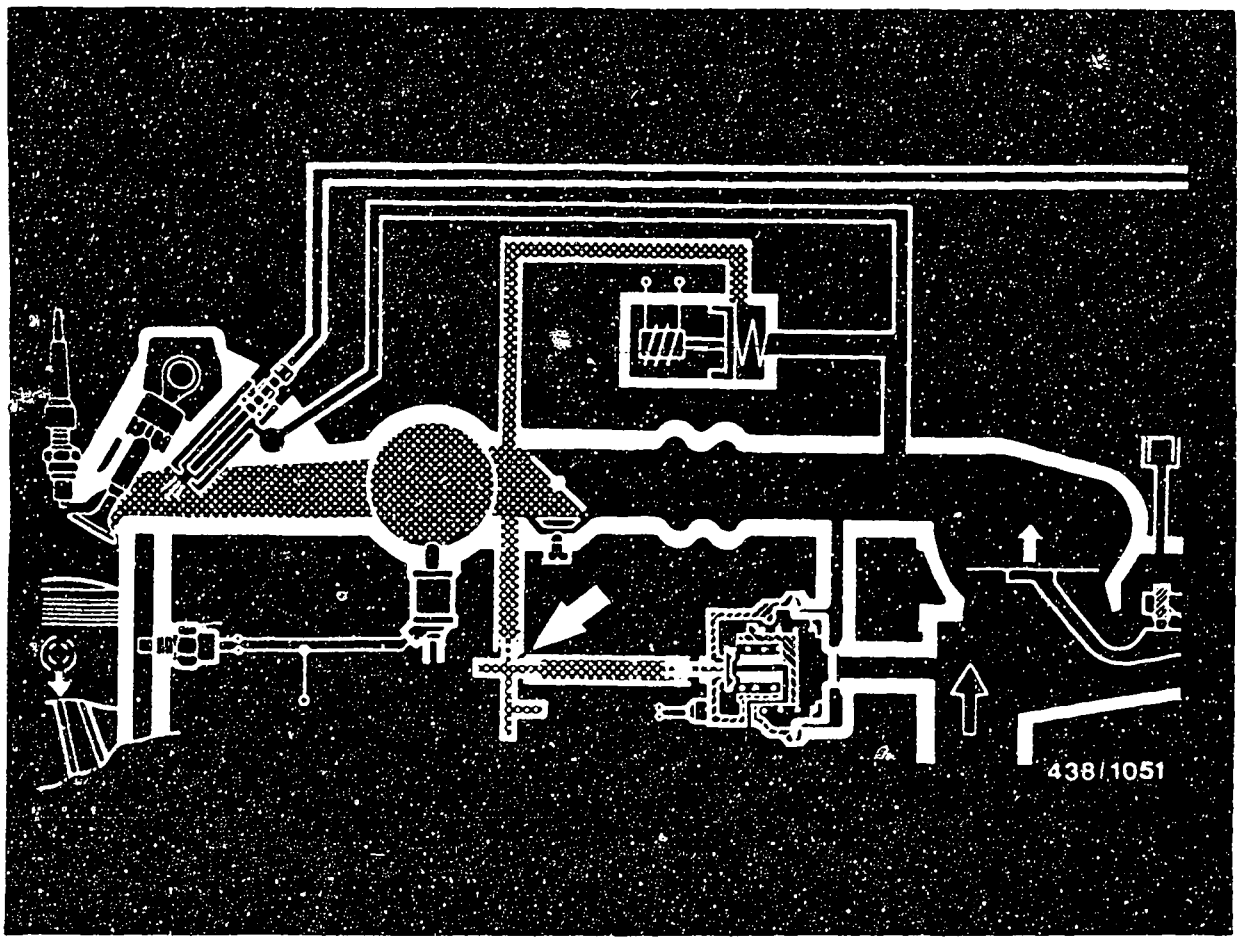
19.2 Idle-speed adjustment

The otherwise customery idle-speed adjustment is not applicable since these vehicles are equipped with an electronic idle-speed stabilization system (not made by Bosch).
The bypass screw on the throttle-valve assembly is set so that, with the engine warm and at an engine speed of 750 ... 850 min^{-1}, the idle controller current is

- 0.4 ... 0.5 A — for vehicles without air conditioner (or with air conditioner switched off)
- 0.3 ... 0.4 A — for vehicles with air conditioner.

If the idle speed differs from the set value, test the idle-speed stabilization system.

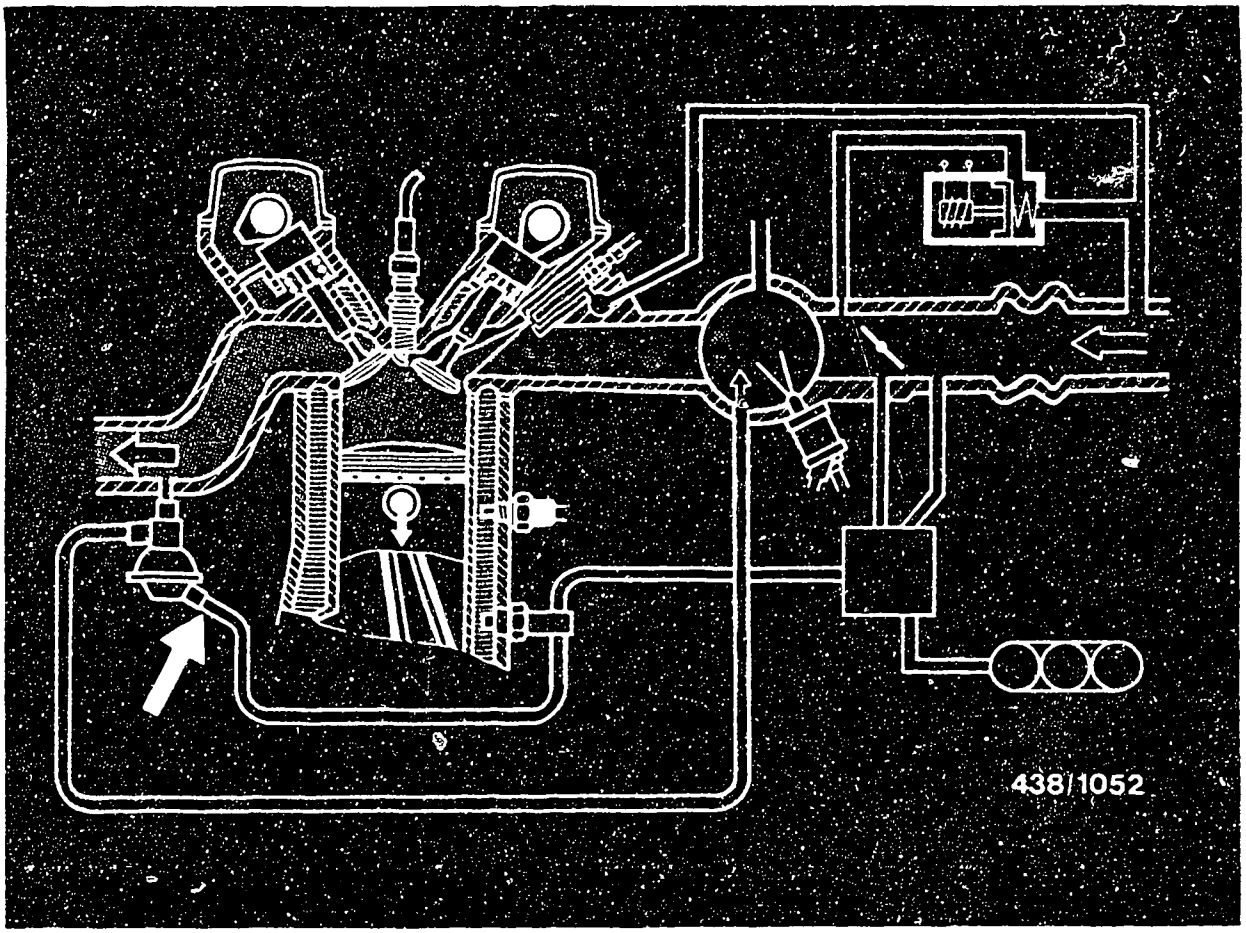
The idle-speed stabilization system is described on Coordinates H1.



19.3 Rendering the overrun cutoff inoperative

Remove hose from manifold-pressure distributor piece (arrow).

The end of the hose and the connection fitting on the manifold-pressure connection piece must be sealed off tight.

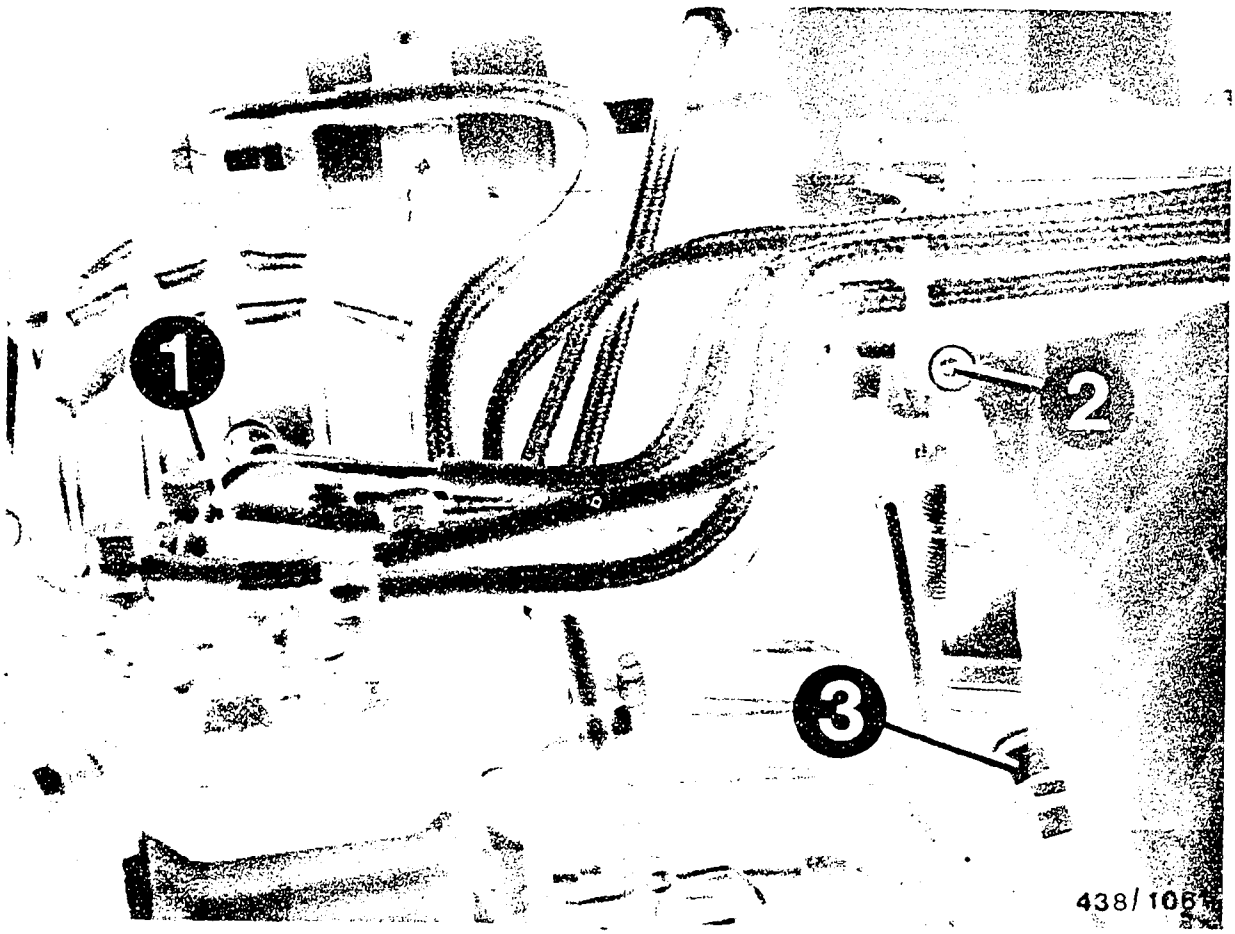


19.4 Rendering the exhaust-gas recirculation inoperative

Concerns only vehicles of the Australia, Canada, Sweden and Switzerland version.

Remove manifold-pressure hose line (arrow) from EGR valve.

The end of the hose and the connection fitting of the EGR valve must be sealed off tight.

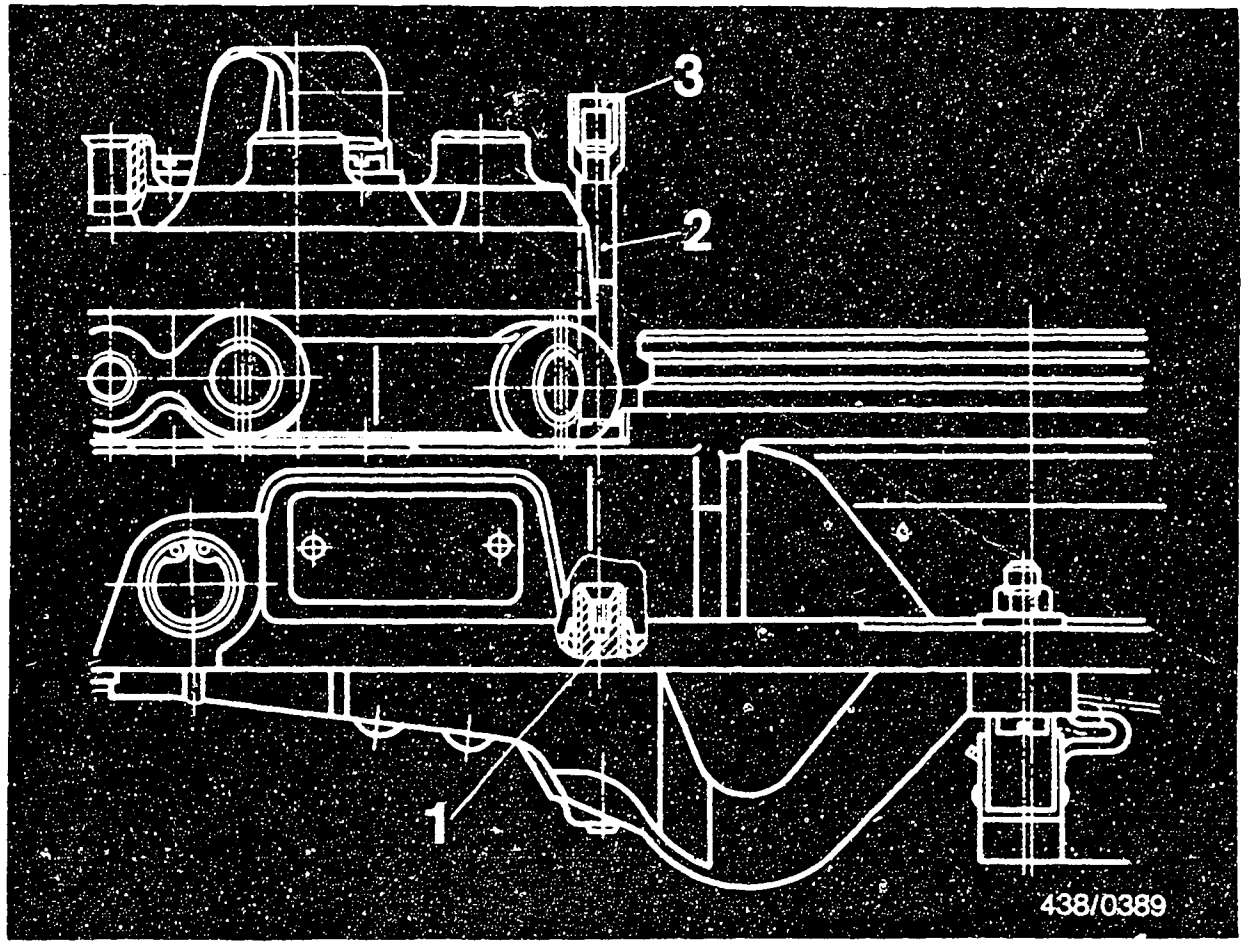


1 = To idle-mixture-adjusting screw
2 = Idle-speed bypass screw
3 = EGR valve

19.5 Idle and CO adjustment

Adjust the idle controller current indirectly via the bypass screw on the throttle-valve assembly.

Adjust the CO in the exhaust gas at the idle-mixture-adjusting screw in the mixture-control unit.



1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Anti-tamper cap

Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture-adjusting screw in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap of the guide tube, the adjusting wrench is passed through the guide tube and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

19.6 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/ CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.
Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissably influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.
These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under part number 3 430 522 002.
The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
e.g. No. 4521/7 from Hazet, 5630 Remscheid.

19.7 Idle adjustment

Test conditions

Engine at normal operating temperature.
Switch on upper beam. Switch off air conditioner.
Overrun cutoff and exhaust-gas recirculation (if fitted) must be rendered inoperative.

Remove crankcase breather hose from cylinder-head cover and seal off end of hose.

Radiator fan must not operate while adjusting.

Idle speed: Audi 200/5E Audi 100/5E Audi Coupé GT/5E	750...850 min^{-1}
With idle controller current Vehicles without air conditioner (or with air conditioner switched off)	0.4...0.5 A
Vehicles with air conditioner:	0.3...0.4 A

CO concentration

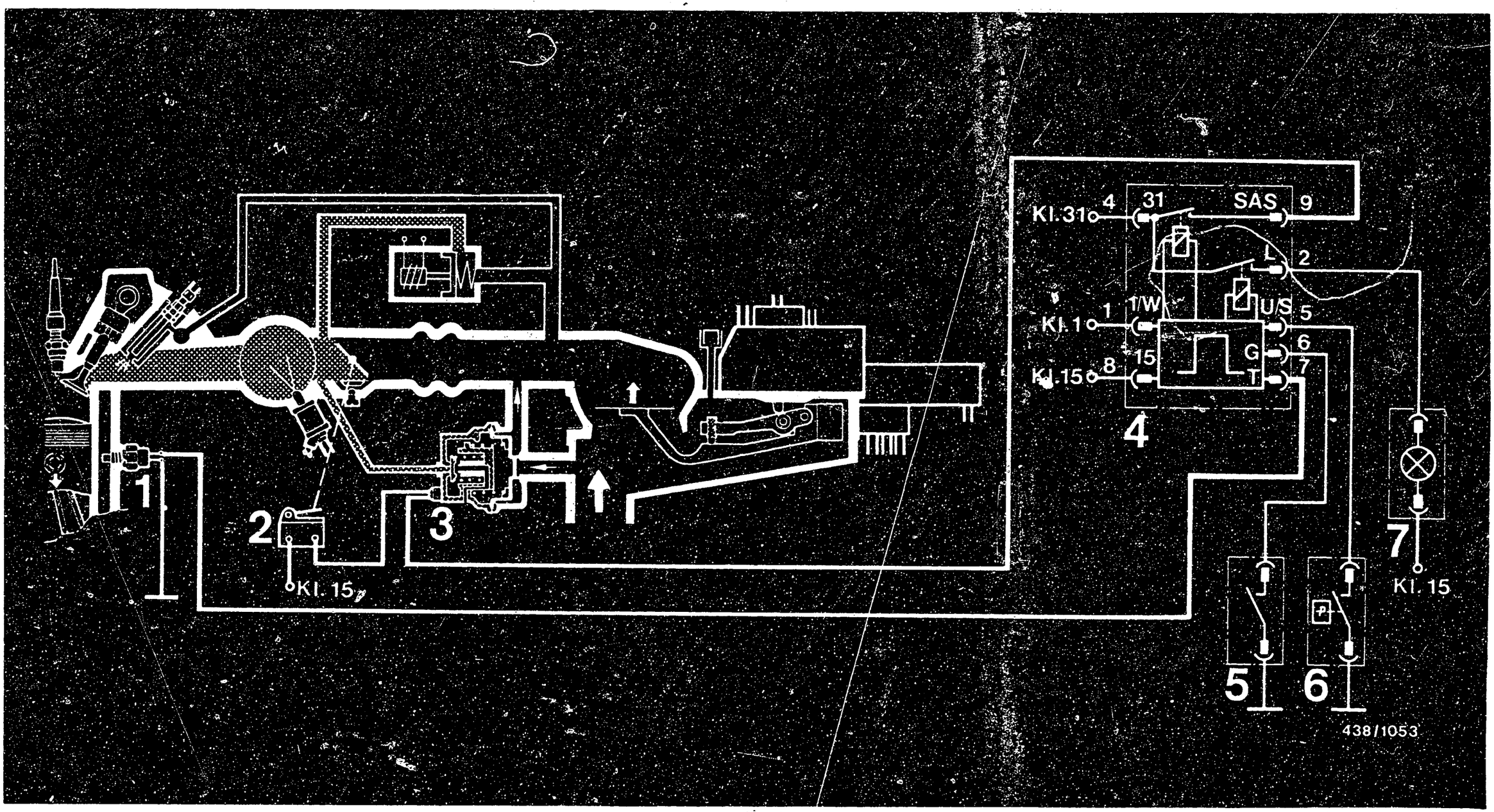
Europe versions:	0.8...1.2 % by vol. CO
Australia, Canada, Sweden and Switzerland versions:	0.3...0.7 % by vol. CO

19.8 Final operations

Re-connect crankcase breather hose to cyclinder-head cover.

Connect manifold-pressure hose line of overrun cutoff to distributor piece.

Connect manifold pressure hose line by exhaust-gas recirculation (if fitted) to EGR valve.



1 = Thermo-switch
2 = Throttle-valve microswitch
3 = Overrun cutoff valve
4 = Control unit for overrun cutoff and gear-shift indicator
5 = Gear switch
6 = Vacuum switch
7 = Bulb for gear-shift indicator

20. Overrun cutoff

20.1 Operation

The control unit combines the functions of "overrun cutoff" and "gear-shift indicator".

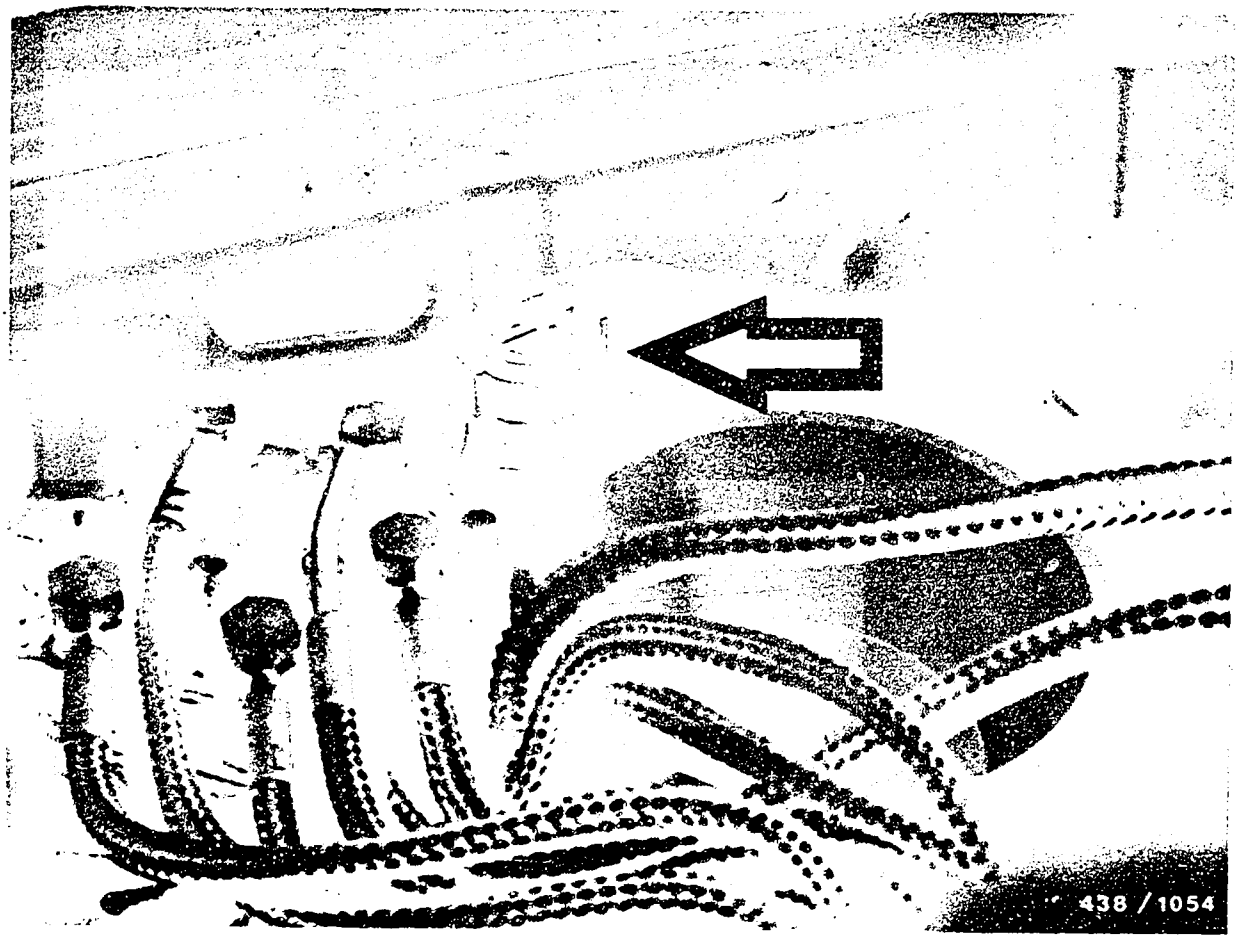
At terminal 1 the control unit receives engine-speed pulses from terminal 1 of the ignition coil.
The thermo-switch, connected to terminal 7, suppresses the overrun cutoff function when the coolant is below +30 °C.

If the engine speed is greater than 1200 min^{-1} and the coolant temperature is higher than +30 °C, the overrun cutoff valve is connected to ground via output 9 of the control unit.
When the throttle-valve microswitch is closed (idle position), battery voltage is connected to the overrun cutoff valve.

If battery voltage (positive) and ground (negative) are applied, the control valve in the overrun cutoff valve opens electromagnetically.
The manifold vacuum acts on the spring-loaded diaphragm and opens the air bypass duct.

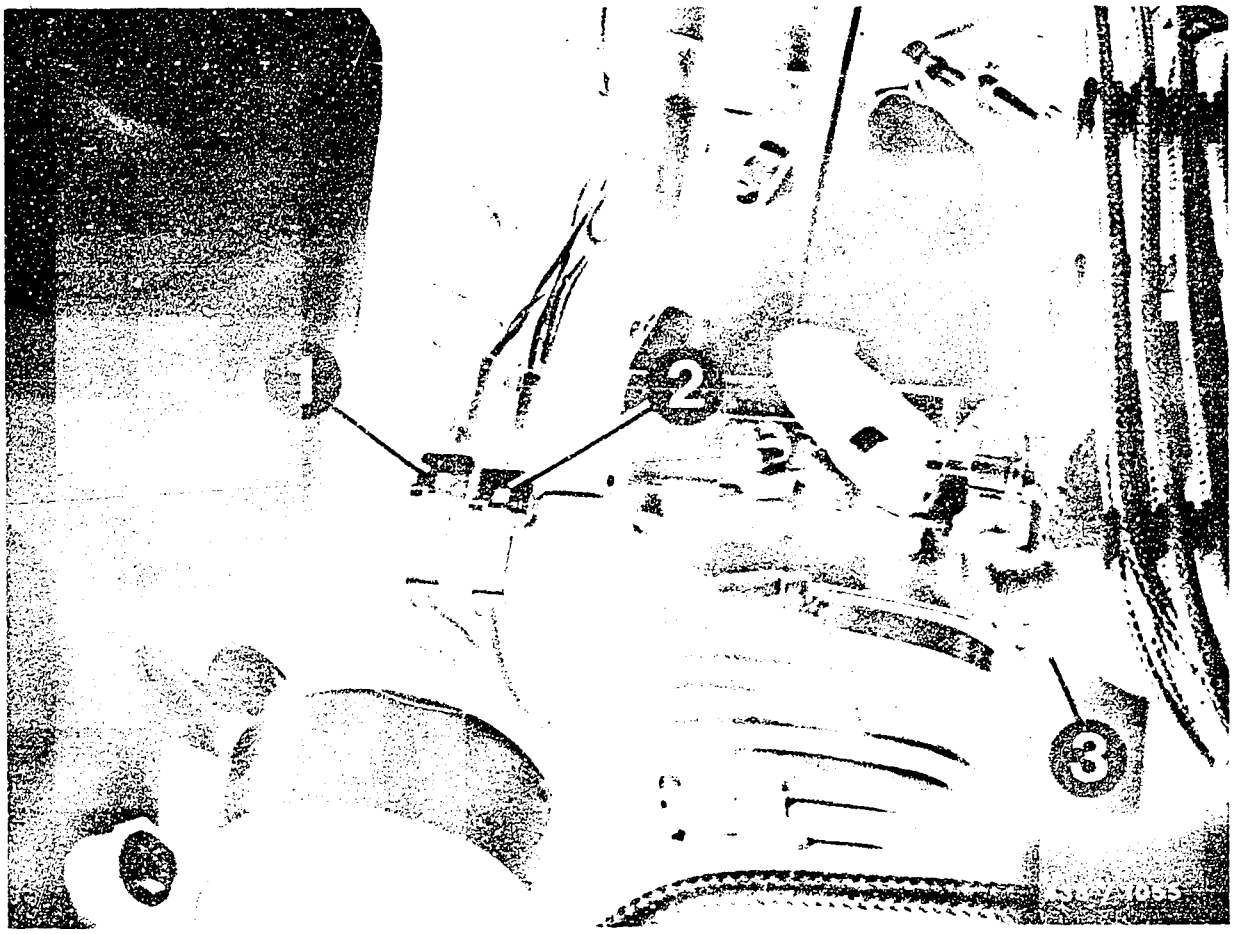
With the overrun cutoff valve open, the air which is inducted by the engine bypasses the air-flow sensor. The air-flow sensor plate remains in the rest position, and no fuel is metered or injected.

If one of these conditions changes, the overrun cutoff valve closes and normal fuel metering is resumed.

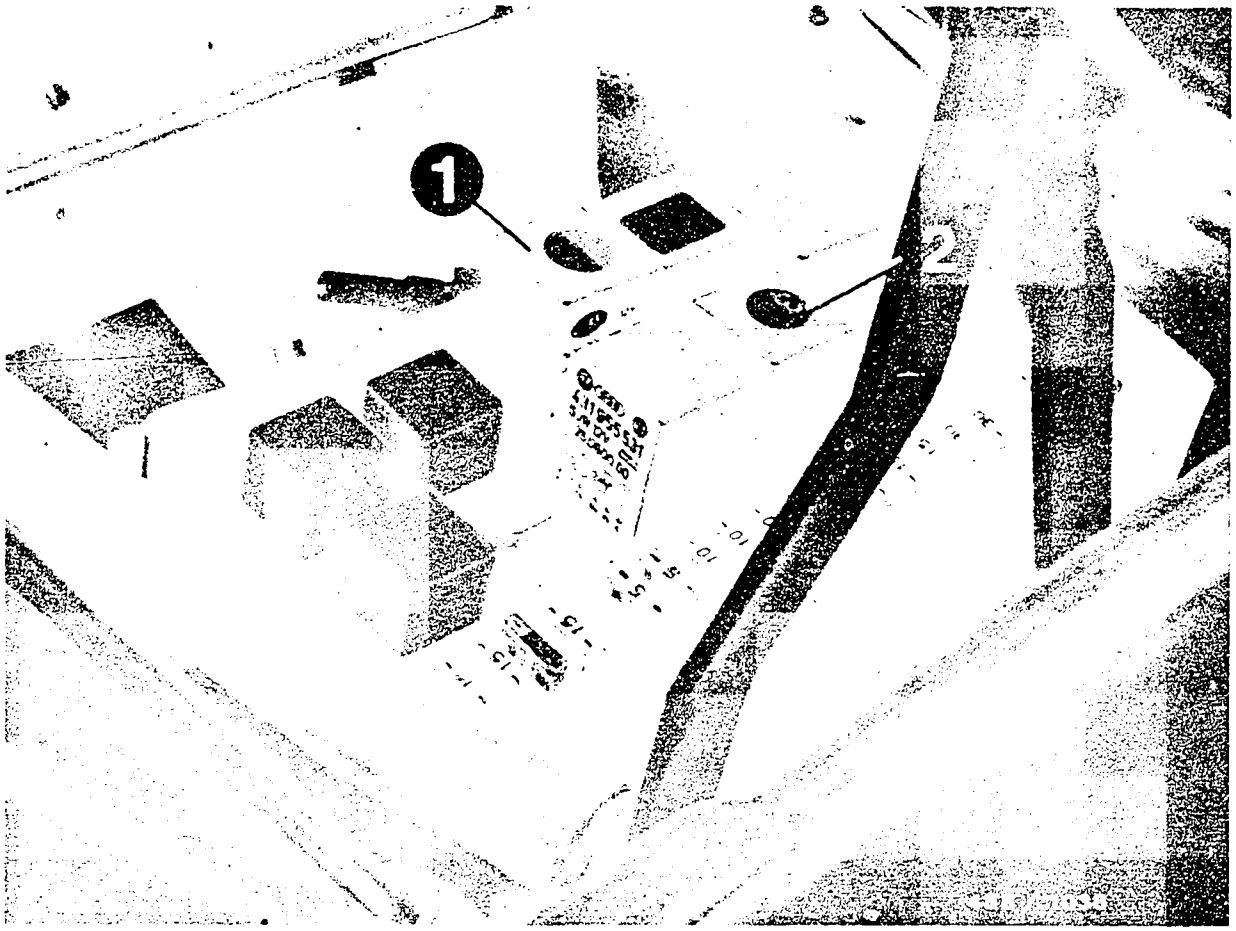


Arrow = Overrun cutoff valve (behind right-hand wall)

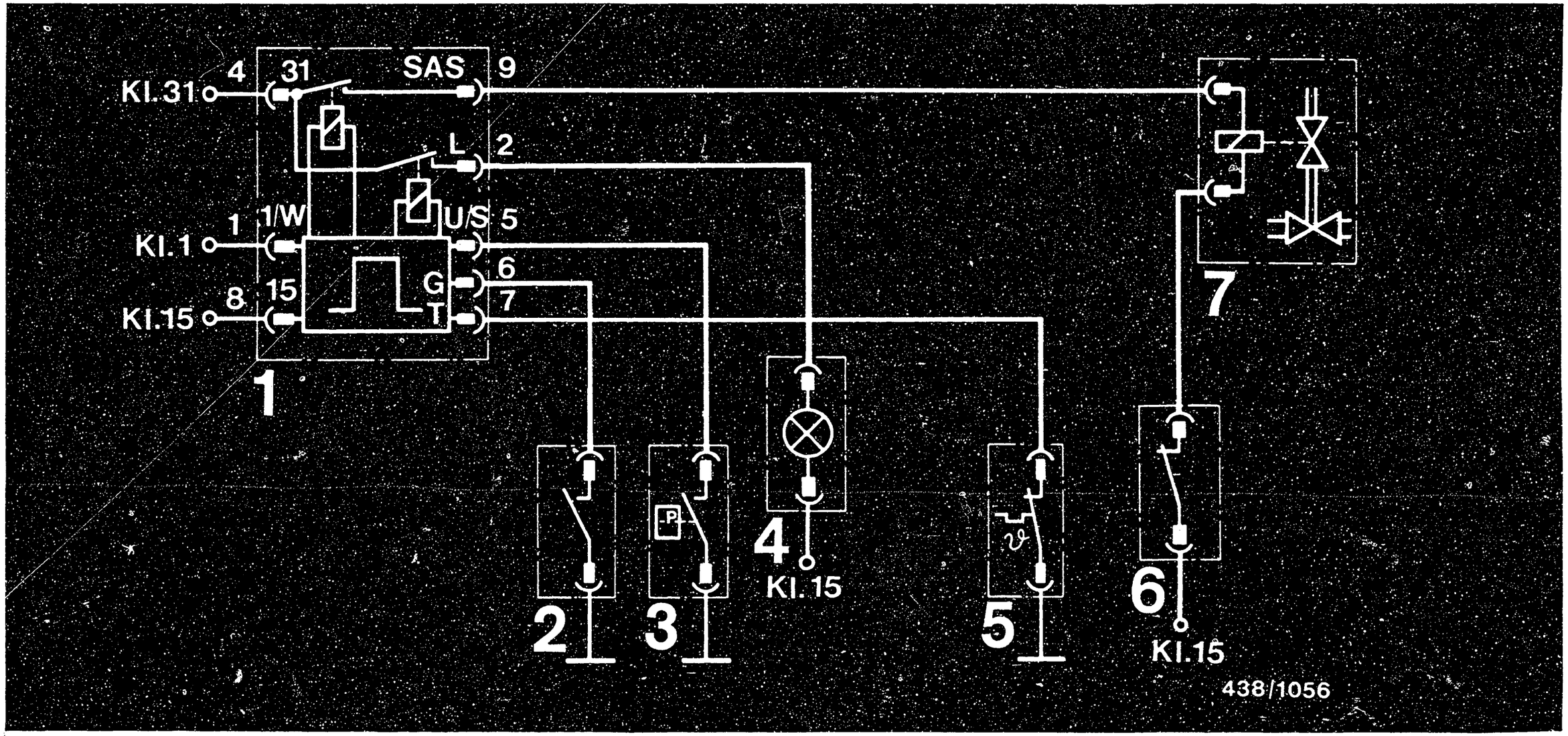
20.2 Installation position of components



1 = Plug connector for overrun cutoff valve
2 = Plug connector for throttle-valve microswitch
3 = Microswitch (concealed under throttle valve).



1 = Control unit for overrun cutoff and gear-shift indicator
2 = Electronic relay of safety circuit



Components of overrun cutoff

1 = Control unit
5 = Thermo-switch
6 = Throttle-valve microswitch
7 = Overrun cutoff valve

Components of gear-shift indicator

1 = Control unit
2 = Gear switch
3 = Vacuum switch
4 = Bulb for gear-shift indicator

20.3 Electrical circuit diagram

The functions of the thermo-switch and of the throttle-valve microswitch are used both for the overrun cutoff as well as for the idle-speed stabilization.

Customer complaint (symtom of trouble)

1. Strong jerk when accelerating out of ouverrun
2. When declutching during the overrun phase the engine stops or drops below idling speed
3. Overrun cutoff also operates when engine is cold (temperatures < +15°C)

1	2	3	Cause of trouble	Remedy	Coordinate
●			Microswitch incorrectly adjusted	Adjust the microswitch so that it is closed with the throttle valve in the idle position and opens as soon as the throttle valve is opened slightly.	A 11, A 14
●			Throttle-valve bearing worn	Check throttle-valve stop and bearing for play. If necessary adjust the stop or replace the bearing.	---
	●		Overrun cutoff valve not closing, leaking	Replace the overrun cutoff valve	A 11, A 12
	●		Control unit defective	Cut-in and cut-out engine-speed thresholds of control unit incorrect. Control unit defective or incorrect - replace.	G 17 / G 18
		●	Thermo-switch not opening, defective	Replace thermo-switch	G 17 / G 18

20.5 Electrical tests

Test all leads for continuity and correct connection.

• Control unit

Test terminals in plug-in base. Control unit removed from plug-in base.

Inputs:

Terminal 15 = Battery voltage (positive) from terminal 15 (ignition)
Terminal 1 = Engine-speed pulses from terminal 1 (ignition coil)
Terminal 31 = Ground from throttle-valve assembly
Terminal T = Ground from thermo-switch (only at engine temperatures ≦ + 20° C).

Output:

Terminal SAS = Connection to one terminal of the overrun cutoff valve

Terminals for gear-shift indicator

Inputs:

Terminal U/S = Ground from vacuum switch
Terminal G = Ground from gear switch

Output:

Terminal L = Connection to bulb of gear-shift indicator.

- Microswitch

Test terminals on connector. Plug connector behind throttle-valve assembly remains connected together.

Input : Vehicle electrical system voltage via terminal 15

Output : Vehicle electrical system voltage switched through to overrun cutoff valve when throttle valve in idle position.

- Overrun cutoff valve

Test terminals in the connector. Undo plug connector behind throttle-valve assembly.

Inputs : One terminal = Connection to SAS terminal on control unit. The other terminal = Connection to microswitch

Resistance test at connector : Test specification approx. 40 ... 90 Ω

20.6 Testing the overrun cutoff for proper operation

- Remove plug from overrun cutoff valve.
- Let the engine idle.
- Apply battery voltage to valve.

Valve opens, engine stops

No

- Let the engine idle.
- Using hand vacuum pump, apply vacuum to overrun cutoff valve - approx 500 mbar
- Apply battery voltage to valve.

Valve opens, engine stops.

No

Valve defective, replace.

Yes

Valve O.K.
Manifold pressure triggering defective

Yes

Overrun cutoff valve O.K.

Continued G 15/G 16

Testing the overrun cutoff for proper operation (continued)

- Pull control unit out of plug-in base.
- Let engine idle.
- Connect terminal SAS to ground.

Valve opens, engine stops.

No → - Test adjustment of microswitch.

Yes

Microswitch must be closed with throttle valve in idle postition.

No → Adjust the microswitch so that it is closed with the throttle valve in the idle position and opens as soon as the throttle valve is opened slightly.

Yes

Microswitch defective - replace.

Microswitch O.K.

Continued G 17/G 18

Testing the overrun cutoff for proper operation (continued)

- Plug control unit into plug-in base.
- Bring warmed-up engine to approx. 3000 min^{-1}.
- Press microswitch.

Valve opens, engine stops

no → Test thermo-switch.

yes

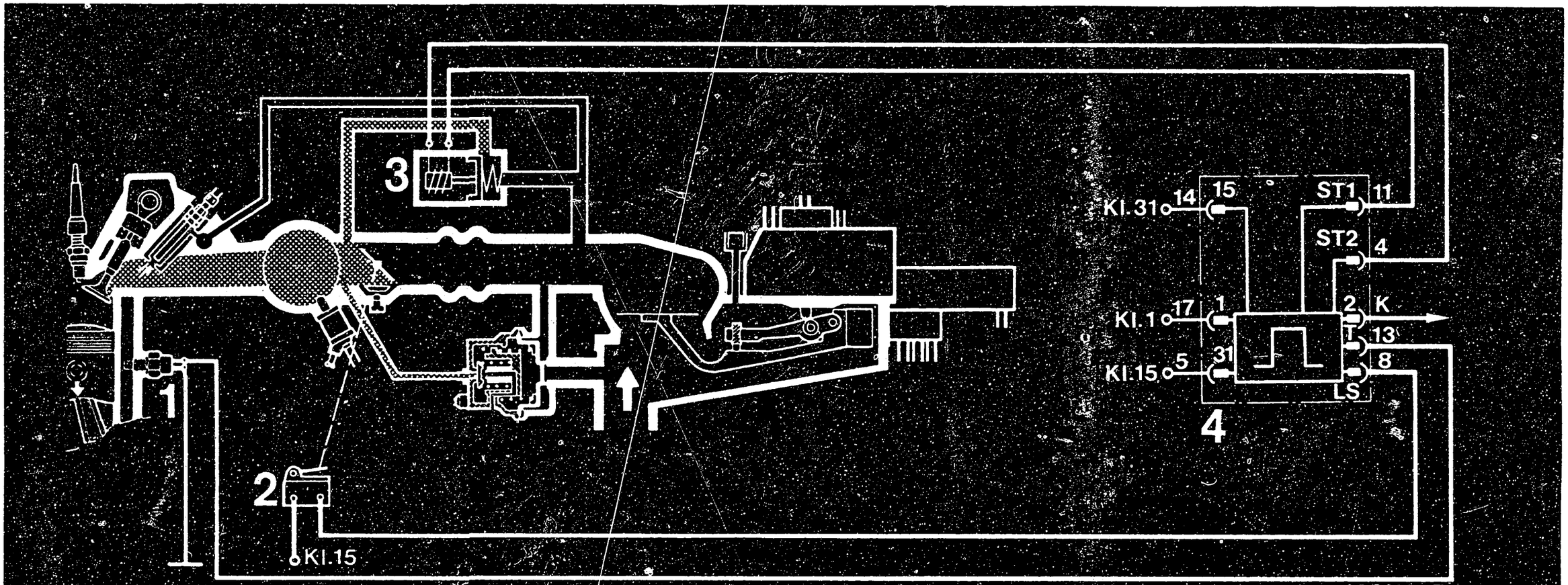
Above 40° C thermo-switch open (reading ∞ Ω with connectors removed)

no → Thermo-switch defective, replace.

yes

Control unit defective, replace.

Control unit and thermo-switch operating. Overrun cutoff O.K.

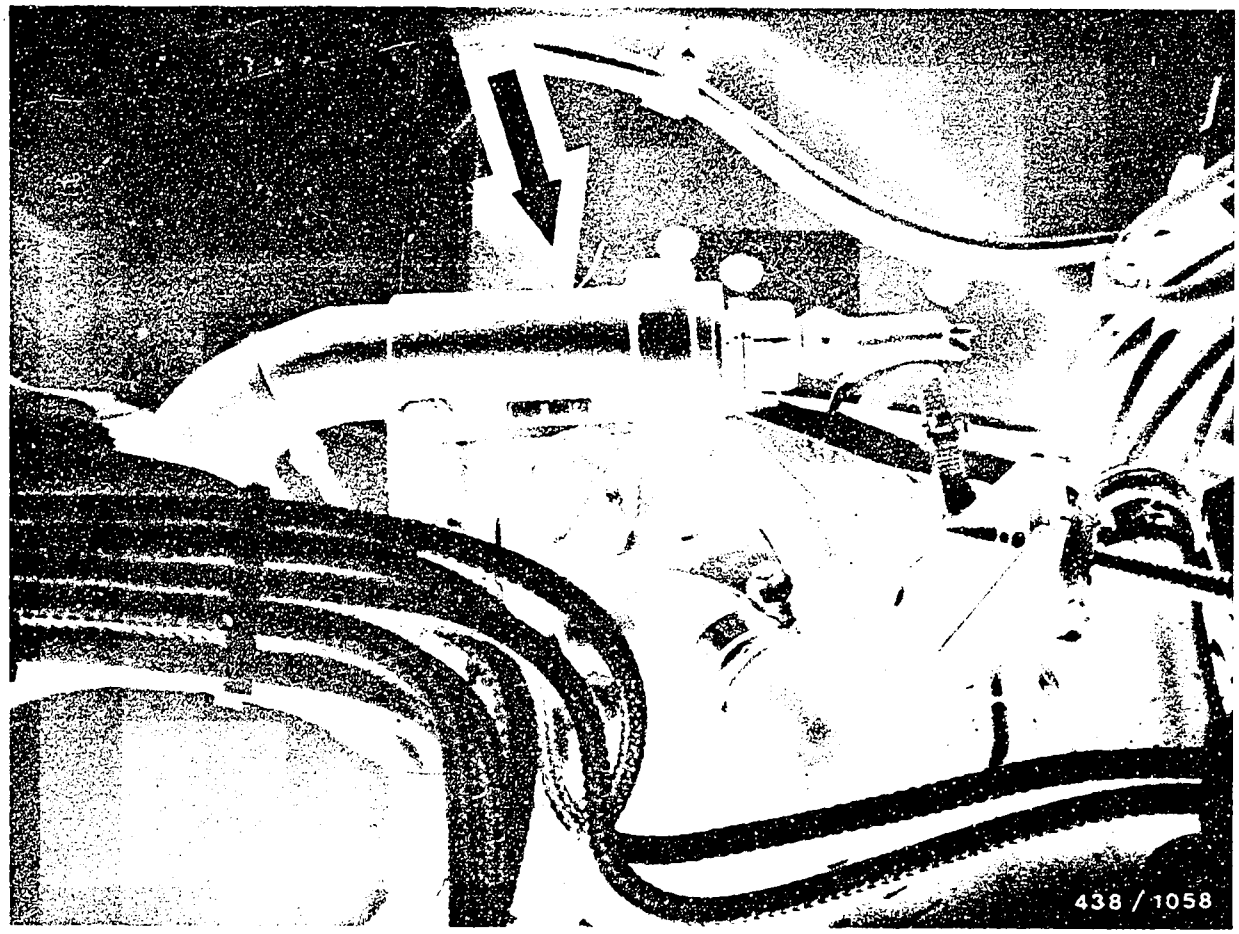


1 = Thermo-switch
2 = Throttle-valve microswitch
3 = Idle controller
4 = Control unit for idle-speed stabilization
K = To air-conditioner compressor

21. Idle-speed stabilization (not made by Bosch)

21.1 Operation

The idle speed is stabilized by the electronic control unit and the idle controller. The idle controller is situated in the air bypass around the throttle valve instead of the otherwise customary auxiliary-air device.
From the control unit the tractive electromagnet of the idle controller receives a variable voltage of constant frequency. This moves the blocking plate in the air duct, thus changing the air throughput.



Arrow = Idle controller

From the ignition pulses (terminal 1) the ACTUAL engine speed is derived, compared in the control unit with a SETPOINT engine speed and the idle controller is actuated accordingly.

The control unit (double relay size) is on the relay board under the instrument panel and occupies positions 11 and 12.

21.2 Components and functions

- **Control unit**

  Processes the input information and actuates the idle controller.

- **Idle controller**

  Changes the air throughput

- **Thermo-switch + 30° C**

  In coolant system for increased idle speed during warm-up period.

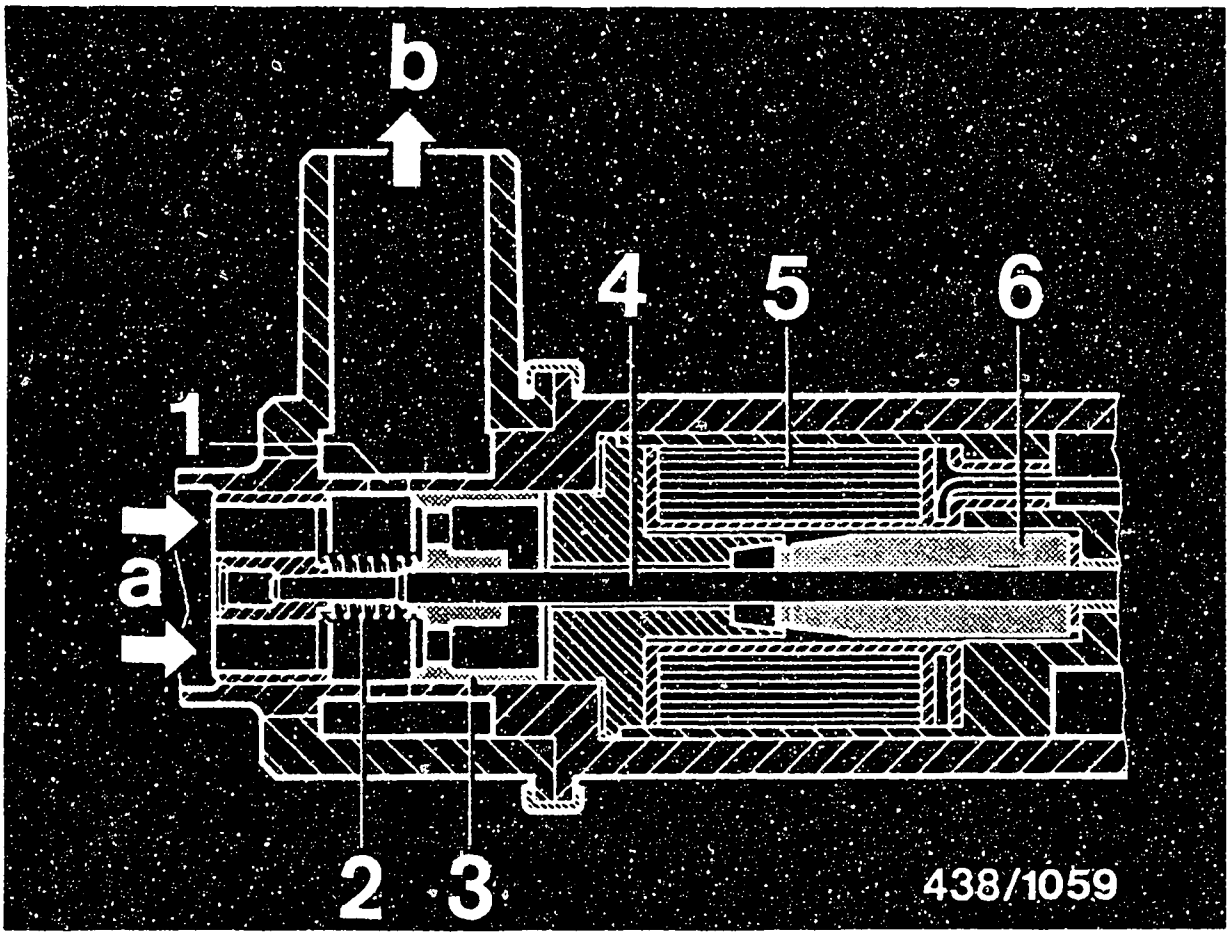
- **Throttle-valve microswitch**

  For idle recognition.

Further inputs to control unit:

Terminal 1 = Engine speed from terminal 1 of ignition coil

Terminal A = Connection from air conditioner compressor.



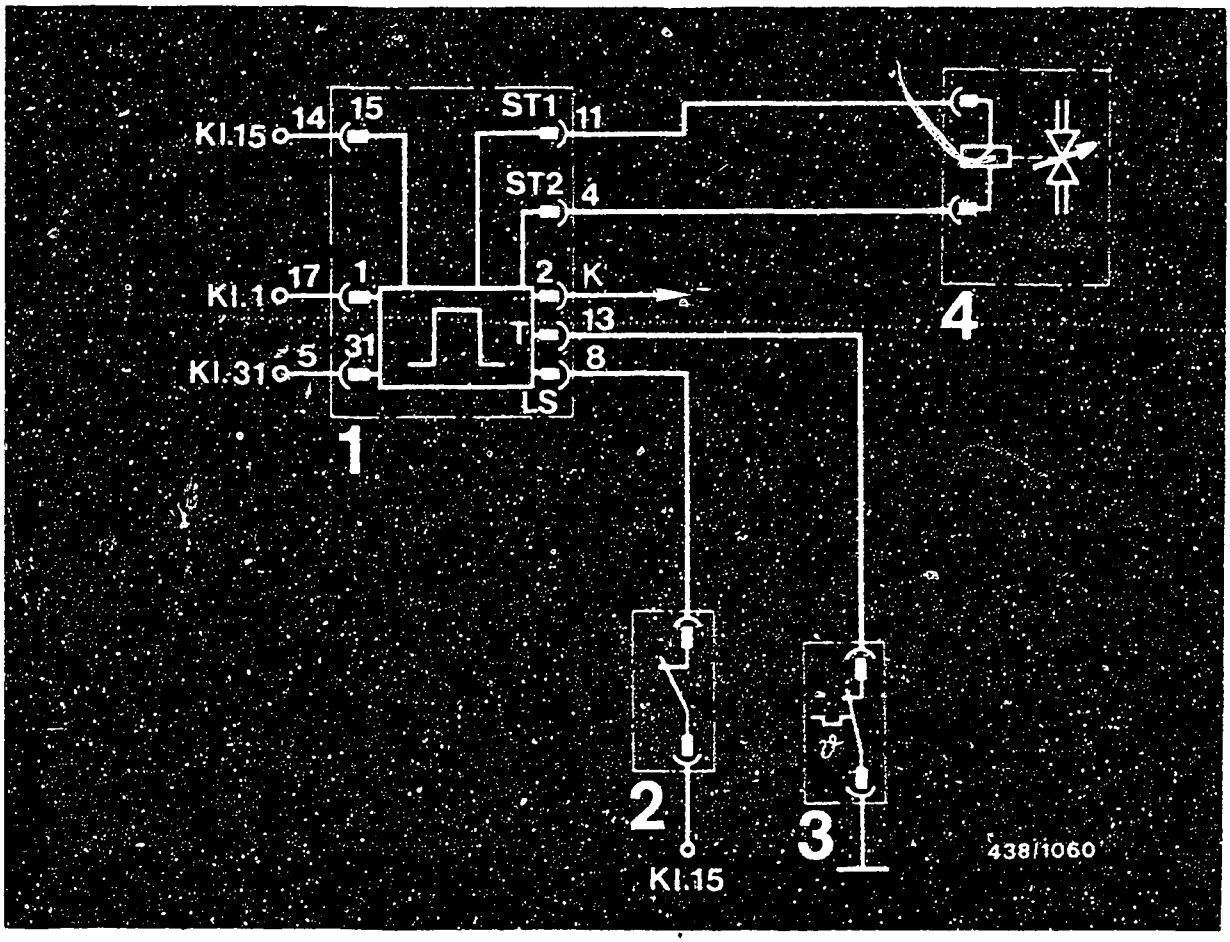
1 = Blocking plate
2 = Compression spring
3 = Piston
4 = Shaft
5 = Solenoid
6 = Magnetic core
a = Air inlet
b = Air outlet

Idle controller

- Engine cold - blocking plate is wide open
  Switch on ignition.
  Controller current should be 30...100 mA

- Engine warm - blocking plate is less open
  Controller current should be:
  Vehicle without air conditioner (or with air conditioner switched off): 450...490 mA

  With air conditioner on 400...440 mA



1 = Control unit
2 = Throttle-valve microswitch
3 = Thermo-switch
4 = Idle controller
K = To air conditioner compressor

21.3 Electrical circuit diagram

The functions of the throttle-valve microswitch and of the thermo-switch are used both for the idle-speed stabilization as well as for the overrun cutoff.

21.4 Notes on testing

Test all leads for continuity and correct connection.

• Control unit

Test terminals in plug-in base.
Remove control unit from plug-in base.

Inputs:

Terminal 14/15	= Vehicle electrical system voltage (positive) from terminal 15
Terminal 17/1	= Engine-speed pulses from terminal 1 (ignition coil)
Terminal 5/31	= Ground (negative)
Terminal K/2	= Connection to air conditioner compressor
Terminal 13/T	= Ground from thermo-switch (only at engine temperatures ≤ + 20° C)
Terminal 8/LS	= Vehicle electrical system voltage from terminal 15. Via microswitch with throttle valve in idle position

Outputs:

Terminal 11/ST1	= To idle controller
Terminal 4/ST2	= To idle controller

• Microswitch

Test terminals at connector. Plug connector behind throttle-valve assembly remains connected together.

Input: Vehicle electrical system voltage via terminal 15
Output: Vehicle electrical system voltage with throttle valve in idle position

• Thermo-switch

Test terminals with connectors disconnected

Below + 20° C: Contact closed (0 Ω)
Above + 40° C: Contact open (∞ Ω).

• Control unit

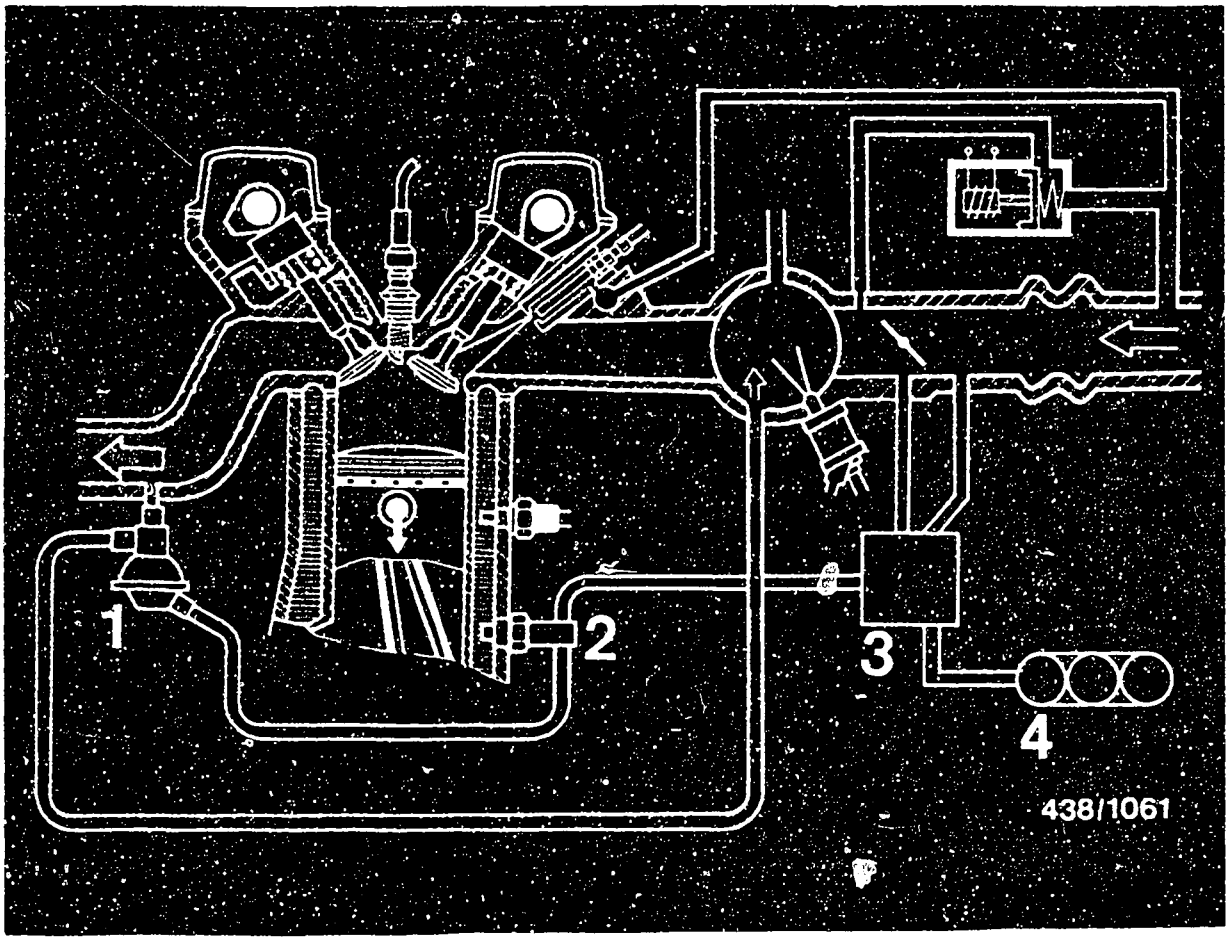
Remove plug from idle controller. Switch on ignition. Voltage across plug = Approx. vehicle electrical system voltage. If not, replace control unit.

• Idle controller

Engine at normal operating temperature. Plug connected to idle controller. The working vibrations at the idle controller can be felt. If not, replace idle controller.

• Test specifications

Idle speed:	750 ... 850 min^{-1}
With idle controller current	
Vehicles without air conditioner (or with air conditioner switched off):	0.4 ... 0.5 A
With air conditioner on:	0.3 ... 0.4 A



1 = EGR valve
2 = Thermopneumatic valve
3 = Vacuum booster
4 = Vacuum reservoir

22. Exhaust-gas recirculation (not made by Bosch)

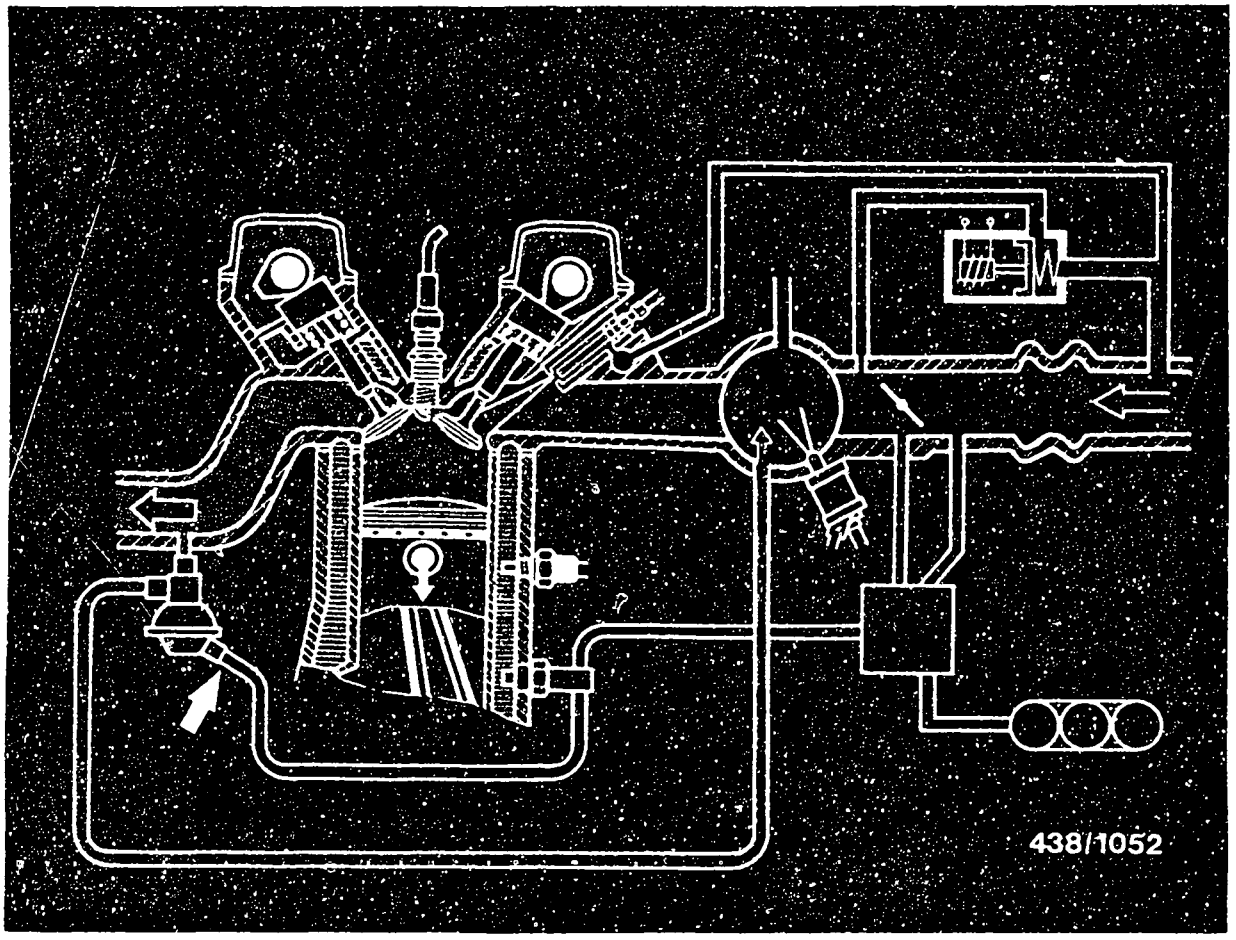
Vehicles for Australia, Canada, Sweden and Switzerland are equipped with exhaust-gas recirculation.

22.1 Operation

By way of a vacuum-controlled EGR valve some of the exhaust gas is returned to the intake manifold when the engine is warm and operating at part load. The participation of exhaust gas in the combustion process reduces the combustion temperature and lowers the emission of nitrogen oxides (NOx).

The thermopneumatic valve and the provision of the manifold-connection port on the throttle-valve assembly ensure that exhaust-gas recirculation is only operative when the engine is warm and operating in the part load range.
There is a reduction in engine speed.
At idle, full load as well as when the engine is cold, exhaust-gas recirculation is inoperative.

If the vehicle is operated in countries with exhaust-emission legislation which does not require such systems, it is not necessary to shut down the exhaust-gas recirculation system.



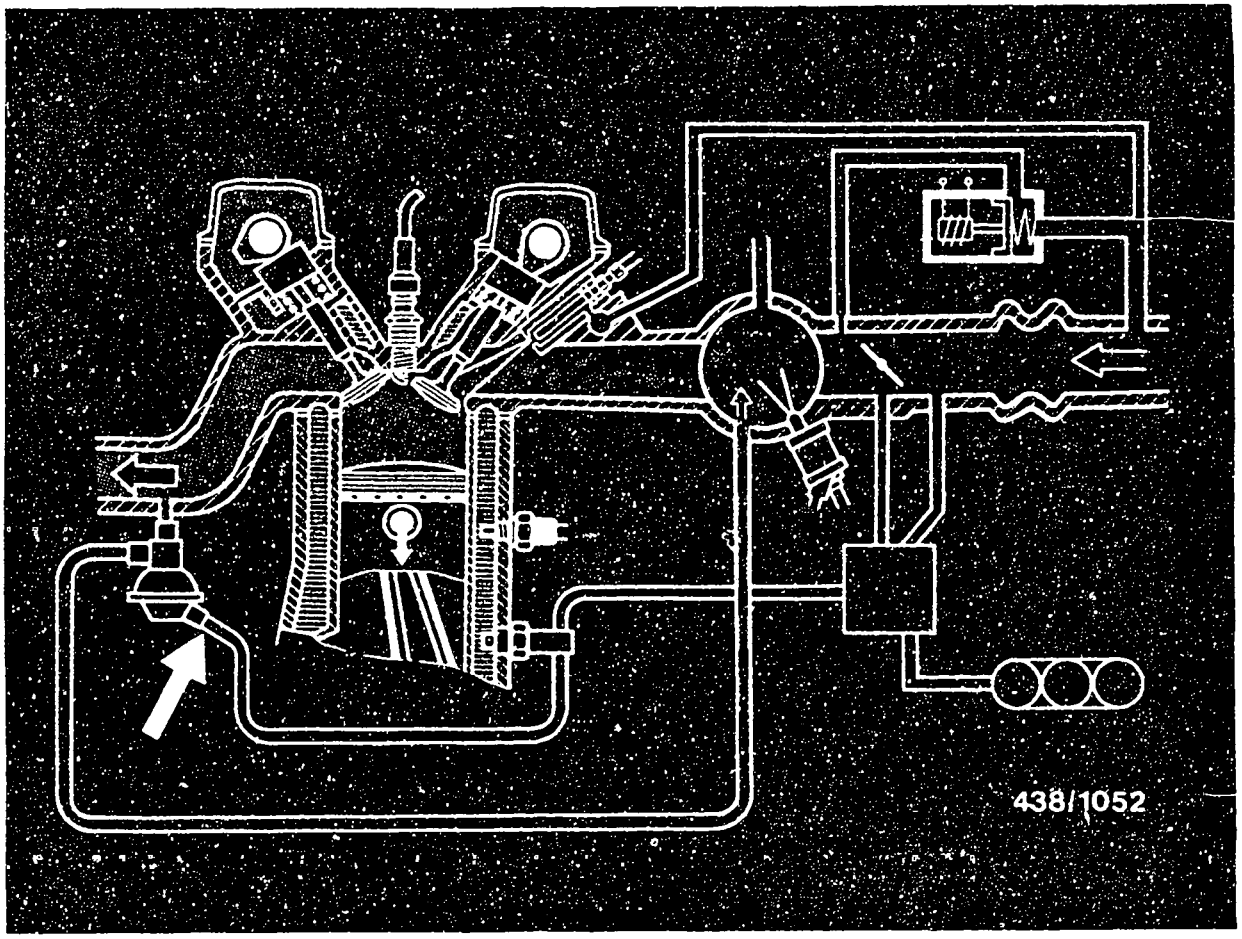
22.2 Tests with engine running

• EGR valve

Remove vacuum-control line (arrow) from EGR valve. Connect Mityvac hand vacuum pump and apply vacuum to EGR valve. There must be a clear deterioration in engine running. If not, replace EGR valve.

• Vacuum control

Remove vacuum-control line from EGR valve and connect Mityvac hand vacuum pump to control line. At part load there must be vacuum. At idle there must be no vacuum. Otherwise, test vacuum connection on throttle-valve assembly.



• Thermopneumatic valve

Remove vacuum-control line (arrow) from EGR valve and connect Mityvac hand vacuum pump to control line.

At engine temperatures below +45° C the thermopneumatic valve must be closed; above +61° C it must be open.

Replace thermopneumatic valve if defective.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 ④	---	---
976	004 ③	---	---
977	004 ③	---	---
978	1 587 410 901	---	---
979	010 004 ③	---	---
980	002	---	---
981	002	---	---
982 ①	003 ④	---	---
982 ②	1 587 410 901	---	---
984	010 004 ③	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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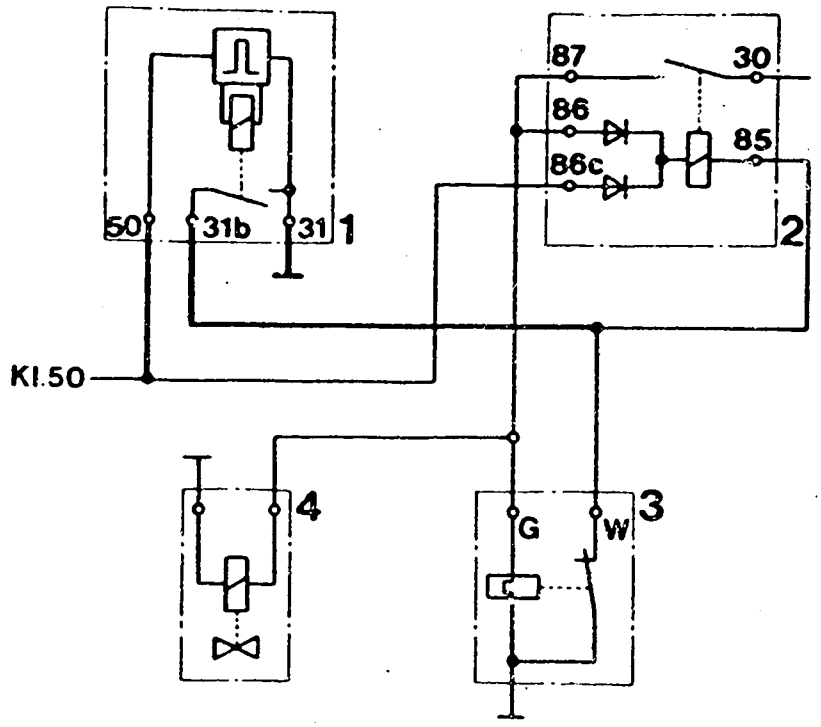
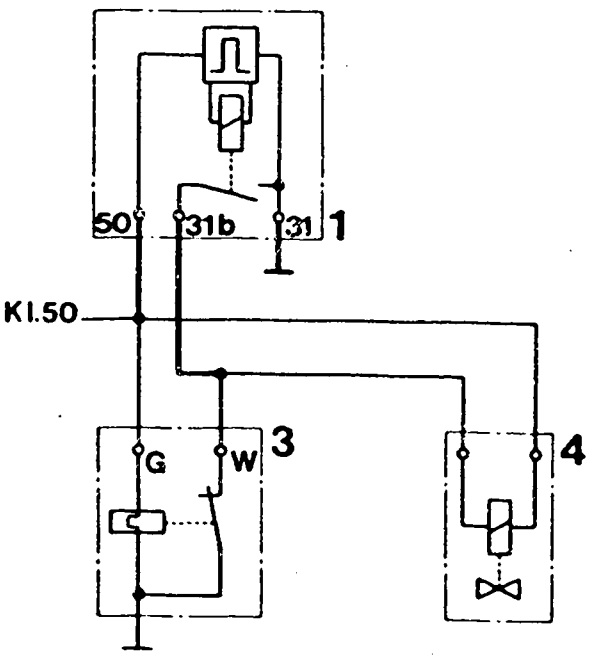


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

O-RING FOR K-JETRONIC INJECTION VALVES
0 437 502

VDT-I-438/108 En
7.1982

For K-Jetronic injection valves with O-ring seals the O-ring is available as a service part under Part No.: 3 430 210 600.

This O-ring is also listed on service-part microfiche EE...* together with other Jetronic service parts.

*- See microfiche EE00 under 0 280 ..

Since the O-rings are exposed to extreme temperatures, they should be replaced whenever service work is performed.
"Unmetered air" which is drawn in through leaky injection valve seals is a frequent cause of trouble.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

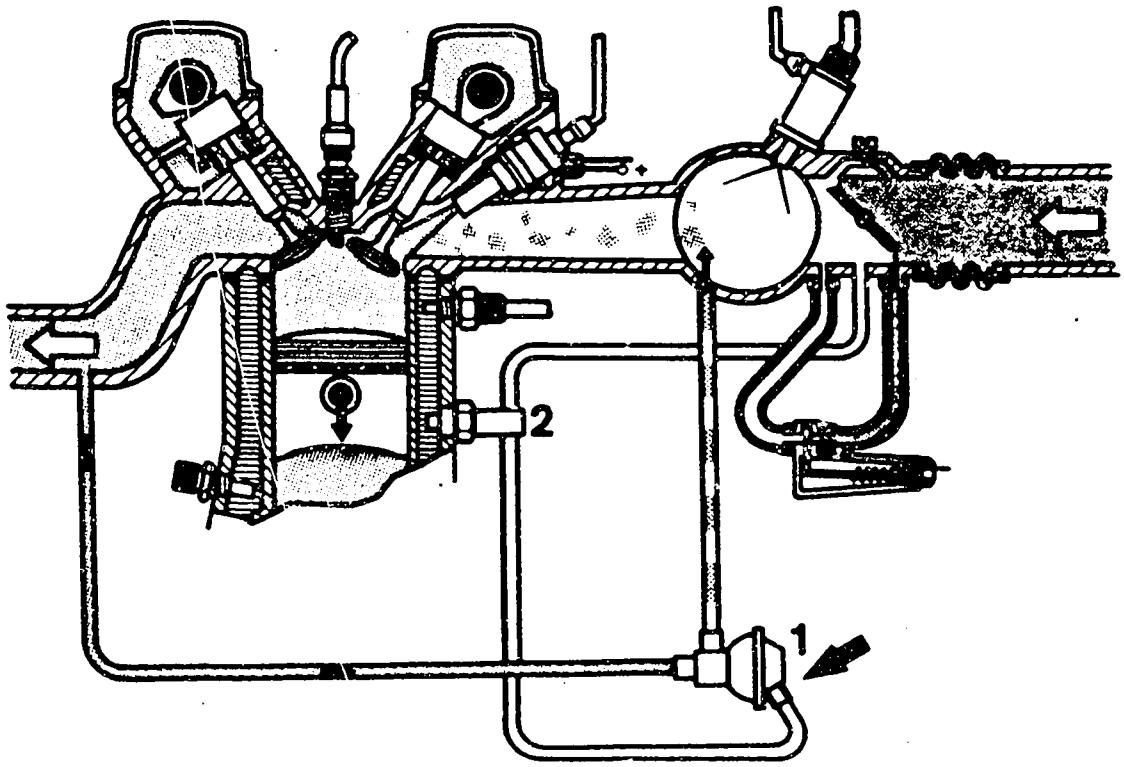
The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

1. Exhaust-gas recirculation (EGR)



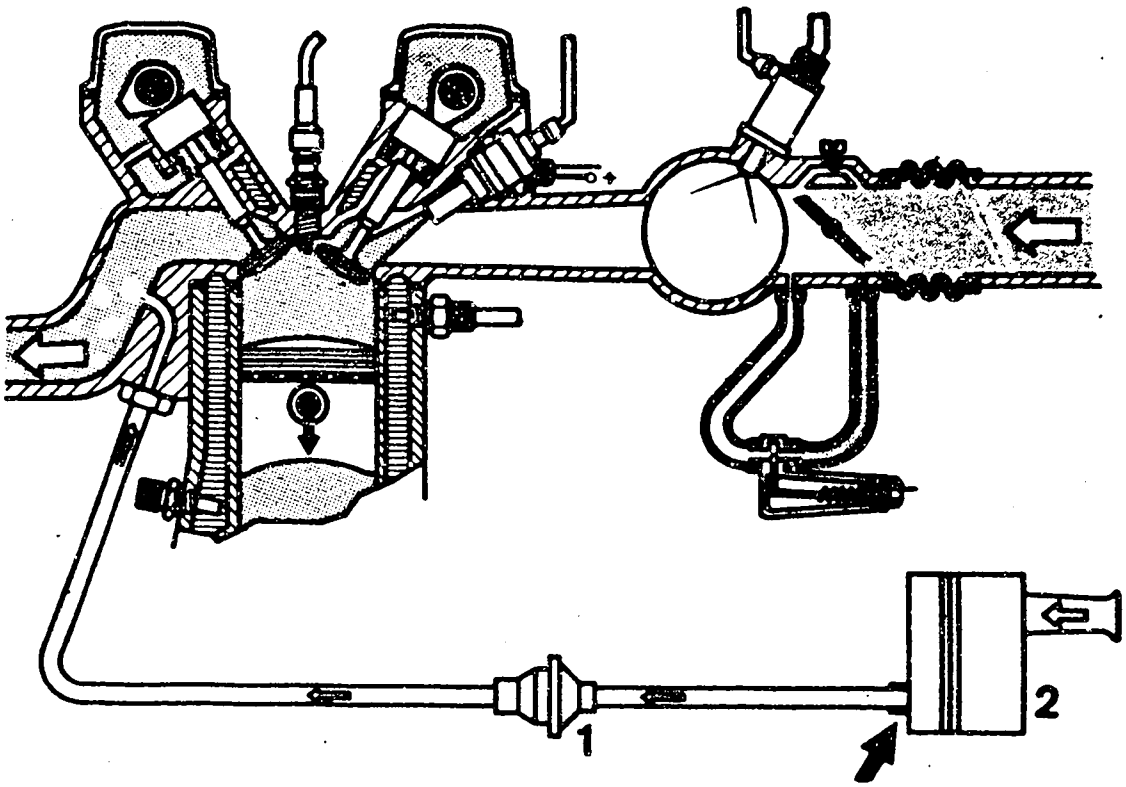
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



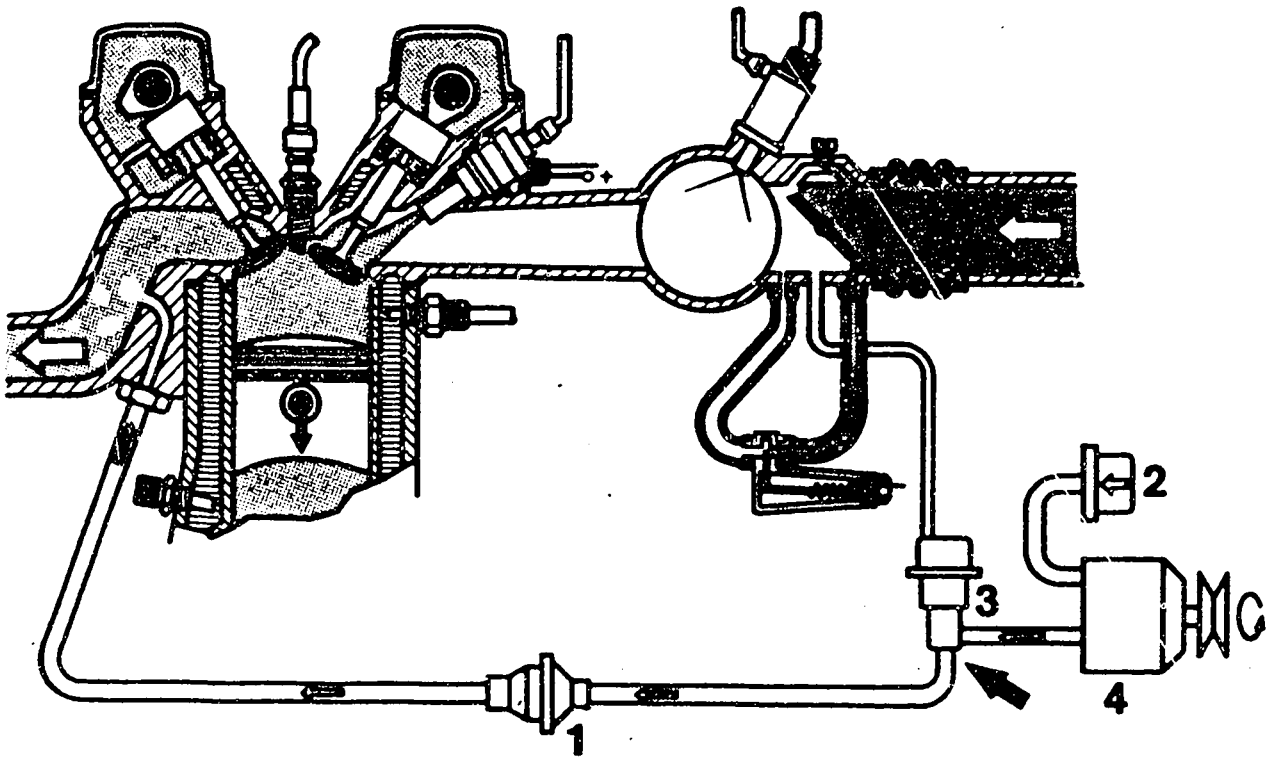
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



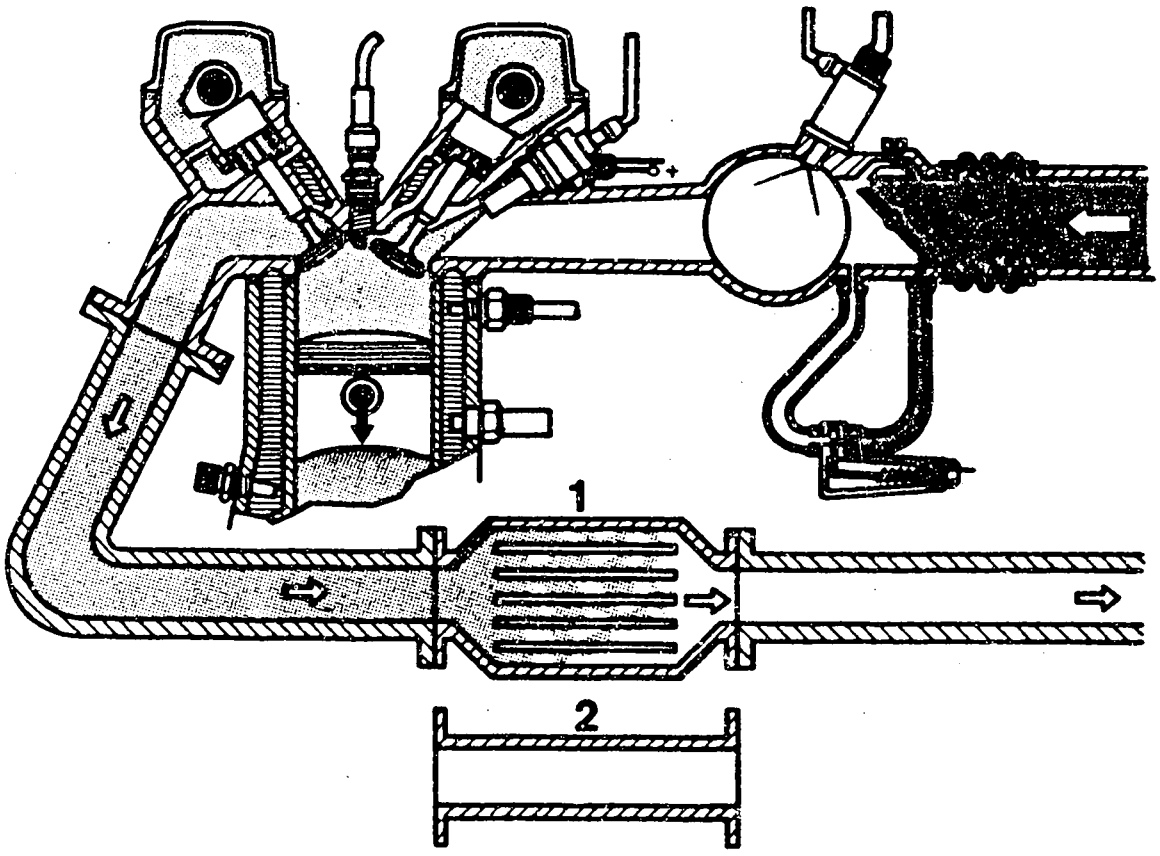
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

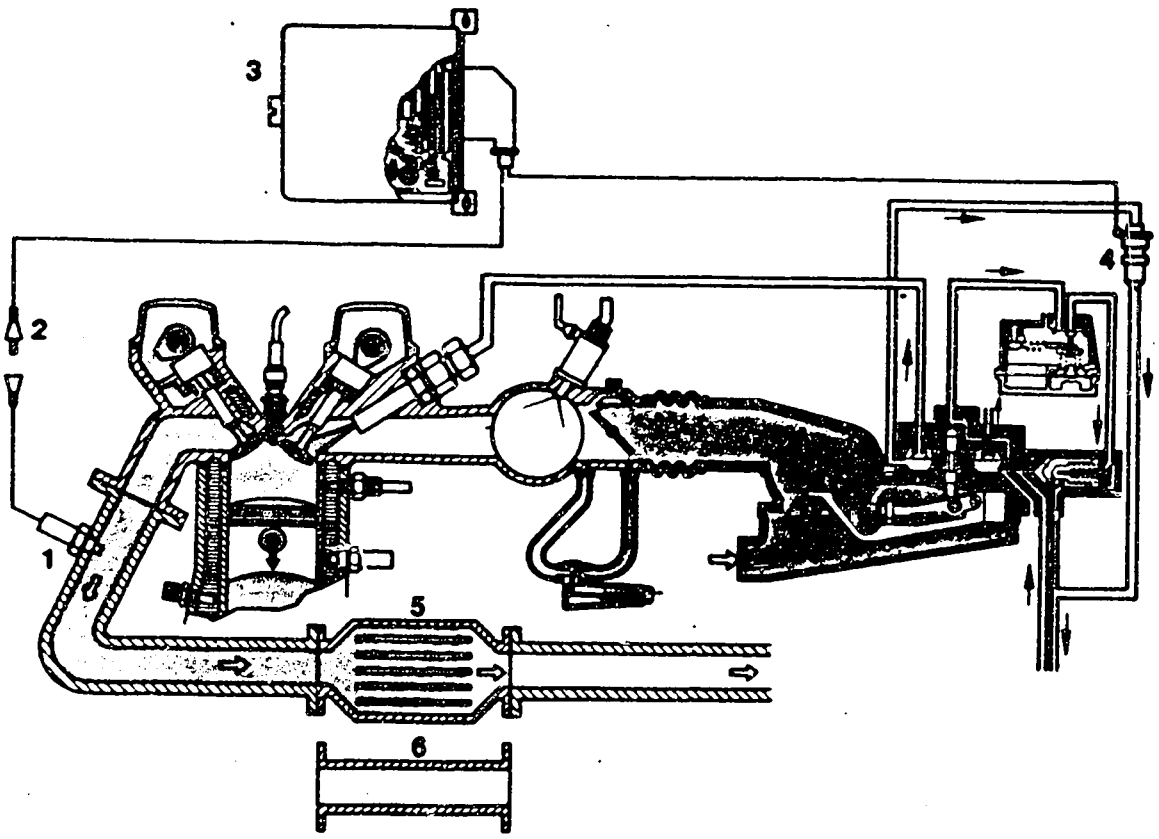
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

on vehicles fitted with Jetronic

VDT-I-Gen. 050 En
9.1982

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

BOSCH
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After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

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